Letter
This letter and attachments represent Powertech (USA) Inc.'s (Powertech's) written comments on the Draft Class III Area Permit for the Dewey-Burdock Project issued for public comment in March 2017. The written comments pertain to the draft permit, Draft Class III Area Permit Fact Sheet, Draft Aquifer Exemption Record of Decision and other supporting documents, including the Draft Cumulative Effects Analysis and Draft Environmental Justice Analysis. Following are general comments followed by specific technical comments (Tables 1 through 5) and additional comments included with proposed alternate solutions for several draft permit conditions (Attachments A-1 through A-10). References are provided as PDF files in Attachment B.
Powertech's primary concern is that the draft permit would impose a raft of unprecedented and wholly unwarranted new requirements for an in-situ recovery (ISR) operation that would prove both operationally and financially burdensome. **Yet EPA has offered no sound scientific or factual justification for the imposition of these additional requirements. Speculation is the only reason that EPA has ever offered for this type of approach.** Because these requirements would be uniquely imposed on Powertech, Dewey-Burdock Project operations would be subjected to a substantial economic and competitive disadvantage.
As explained in more detail in other portions of Powertech's comments, some of the unprecedented requirements that the draft Class III area permit would impose on Dewey-Burdock Project operations include:
*conducting post-restoration groundwater monitoring for each wellfield after NRC approval that groundwater restoration has been successfully completed;
* installing a new down-gradient compliance boundary (DGCB) monitoring well network for each wellfield inside of that currently required by NRC license requirements;
*collecting core samples prior to operations and testing these in "pass/fail" laboratory column tests, where a single constituent measured above background concentration would signal a failed test;
*quarterly groundwater sampling from the DGCB monitoring wells to establish initial baseline values before injection begins in the wellfield;
*additional monitoring and corrective action requirements for an excursion detected in a non-injection interval monitoring well beyond those reviewed and approved by NRC;
*additional monitoring and corrective action requirements for an "expanding excursion plume"; and
*additional monitoring and corrective action requirements for a "remnant excursion plume".

The only justification that EPA has ever offered for considering such requirements has been presented in support of the Agency's ongoing but uncompleted rulemaking to impose expansive new requirements in conjunction with setting health and environmental protection standards under the Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA). That rulemaking began with publication of a proposed rule on January 26, 2015 (80 Fed. Reg. 4156; **Exhibit 007**). For reasons that have been amply documented in comments on that proposal, EPA proposed regulatory requirements that exceeded its statutory authority under UMTRCA and for which it provided no scientific or technical justifications. In January 2017, EPA discarded the 2015 proposal and published another proposal, 82 Fed. Reg. 7400 (January 19, 2017; **Exhibit 025**).[1] In so doing, EPA openly acknowledged the lack of any support for the types of provisions that now are proposed in the draft Class III permit: "Focusing on the area of surrounding or adjacent aquifers, the EPA acknowledges that the Agency does not have sufficient information to document a specific instance of contamination of a public source of drinking water caused by an ISR." 82 Fed. Reg. at 7404. Instead of providing any scientific evidence to support the need for additional regulations, EPA engages in speculation by suggesting that "the lack of data does not demonstrate that no contamination is occurring, as industry commenters assert, but instead merely demonstrates the lack of data available to be able to make such a determination, especially here there has been limited post-restoration monitoring." 82 Fed. Reg. at 7404. As noted below, this speculation runs contrary to the conclusions of the NRC based on data amassed by NRC and operators over decades of experience with ISR technologies. As noted by the Supreme Court of the United States, it is also an unlawful basis for administrative action: "assumptions are not a proper substitute for the findings of a significant risk of harm required by the Act."[2]

Footnote 1: EPA's initiation of this rulemaking highlights another fatal flaw in the proposed requirements of the Class III permit in that those requirements would impose as immediately effective and mandatory provisions that EPA has only proposed for public review and comment and has not yet even concluded should be adopted. The January 19, 2017 proposal is open for public comment through July 18, 2017, after which EPA must fully consider and address the many comments that it will receive in response to that proposal before deciding whether to promulgate any of the requirements proposed. EPA noted that it "received over 5,380 public comment letters from a wide range of stakeholders, with comments covering more than 80 different topics" on the previous proposal (82 Fed. Reg. at 7402), and it is likely to receive a comparable number of comments on its revised proposal. It is highly likely that EPA will make changes in its proposal before adopting any final rule. Under the circumstances, it would be arbitrary and capricious to saddle the Dewey-Burdock Project with requirements still in the formative stage, especially as those requirements would affect the post-restoration phase of the project that will be many years away even when operations commence.

Footnote 2: Industrial Union Dept., AFL-CIO v. American Petroleum Institute, 448 U.S. 607, 662 (1980) ["IUD v. API"].

In this case, the Safe Drinking Water Act (SDWA) "prevent[s] underground injection which endangers drinking water sources."[3] It does not prevent all underground injection or even all movement of contaminants in fluid moving into USDWs. The SDWA prevents the movement of "endangering"[4] contaminants into USDWs. "Contaminant" is defined in 40 CFR § 144.3 so broadly as to have little meaning without the consideration of endangerment: "Contaminant means any physical, chemical, biological, or radiological substance or matter in water." Quite simply, the SDWA cannot be read to prevent all movement of "contaminants" into USDWs. It is directed only at "endangering" contaminants. This is very similar to the observations of the Supreme Court: "[R]equiring the Secretary to make a threshold finding of significant risk is consistent with the scope of the regulatory power granted to him by § 6(b)(5), which empowers the Secretary to promulgate standards, not for chemicals and physical agents generally, but for "toxic materials" and "harmful physical agents." IUD v. API at 643-44. The SDWA is likewise directed at "endangering" contaminants.

Footnote 3: 42 U.S.C. § 300h(b)(1).

Footnote 4: "Endangering" is defined in 42 U.S.C. § 300h(d)(2) and in 40 CFR § 144.12(a).

Consequently, the proposed draft permit is fundamentally flawed because it is based on speculation about potentially existing but completely unobserved and unproven effects rather than "the best available peer-reviewed science and economics." Accordingly, many of the proposed permit conditions would unnecessarily burden the recovery of uranium essential to the use of nuclear energy in the United States by curtailing and imposing significant costs on the permitting and operation of uranium ISR projects essential to the utilization of nuclear energy resources. The imposition of such requirements contravenes the essence of energy and regulatory policies embedded in Executive Order 13783 "Promoting Energy Independence and Economic Growth" (March 28, 2017); Executive Order 13777 "Enforcing the Regulatory Reform Agenda" (February 24, 2017); and Executive Order 13771 "Reducing Regulation and Controlling Regulatory Costs" (January 30, 2017).

In addition to proposing unsupported requirements, EPA has encroached into areas already fully addressed by the license issued by the NRC. As noted throughout Powertech's comments, these forays would impose requirements that are not only unnecessary because already addressed by NRC, but also requirements that are in conflict with the NRC license provisions. Imposing requirements that address the very same issues as addressed by the NRC but in a manner that is inconsistent and conflicting is no way to be "prudent and financially responsible in the expenditure of funds, from both public and private sources" as mandated by Executive Order 13771. In order to "manage the costs associated with the governmental imposition of private expenditures required to comply with Federal regulations," EPA needs to base its permit requirements on "transparent processes that employ the best available peer-reviewed science and economics" instead of relying on speculation to impose unnecessary and conflicting requirements. See Executive Order 13771; Executive Order 13783.

G-1

G-1: As a general matter, there is no evidence of off-site impact to non-exempt groundwater even after decades of uranium ISR operations in the U.S. There is significant support for this conclusion. First is documentation from the NRC staff in a 2009 memorandum to the NRC Commission (**Exhibit 001 at 2**), which found that:

The Staff is unaware of any situation indicating that: (1) the quality of groundwater at a nearby water supply well has been degraded, (2) the use of a water supply well has been discontinued, or (3) a well has been relocated because of impacts attributed to an ISR facility.

The same document describes NRC staff's evaluation of excursions at historically operated ISR facilities and concludes that no excursion has resulted in environmental impacts:

With regard to the migration of production liquids toward the surrounding aquifer, each licensee must define and monitor a set of nonhazardous parameters to identify any unintended movement toward the surrounding aquifer. Exceedances of those parameters result in an event termed an excursion; excursion events are not necessarily environmental impacts but just indicators of the unintended movement of production fluids. The data show over 60 events had occurred at the 3 facilities. For most of those events, the licensees were able to control and reverse them through pumping and extraction at nearby wells. Most excursions were short-lived, although a few of them continued for several years. None had resulted in environmental impacts.

Second, as noted above, EPA itself acknowledged this in January 2017 (**Exhibit 025 at 7404**):

Focusing on the area of surrounding or adjacent aquifers, the EPA acknowledges that the Agency does not have sufficient information to document a specific instance of contamination of a public source of drinking water caused by an ISR.
Third is NUREG/CR-6733 (**Exhibit 002 at 4-38**), which addresses the history of excursions at U.S. ISR facilities and documents the finding that:
[T]here were no reports of extraction fluid excursions being detected in off-site water supplies in any of the documentation for U.S. uranium ISL sites reviewed for this report.
Fourth is documentation from the Texas Commission on Environmental Quality **(Exhibit 003 at 22)** that no such impacts have been documented in Texas:
With regard to research on the effects of similar mining projects on neighbors, the Executive Director is not aware of a documented case of off-site groundwater contamination from a Class III injection well operation in over 30 years of in situ uranium mining in South Texas. Also, the Executive Director is not aware of any other scientific evidence that in situ uranium mining in Texas has led to adverse health effects on the public.
Based on extensive research of the NRC ADAMS document server, Wyoming DEQ permitting files, and other publicly available information sources, Powertech is unaware of any negative impact to a water supply well located off-site from an ISR operation since these studies were published. Based on the lack of historical impacts at uranium ISR operations using groundwater protection measures consistent with those required by the NRC for the Dewey-Burdock Project, the additional monitoring requirements proposed by EPA are unnecessary and financially burdensome.
G-2
As noted, the Draft Class III Area Permit (draft permit) includes many unprecedented requirements that are not included in Class III permits for any other ISR facilities within the U.S. These include, but are not limited to, post-restoration groundwater monitoring requirements, column testing requirements and additional excursion monitoring and corrective action requirements. Rather than citing any impacts to groundwater quality resulting from historically or currently operated ISR facilities, none of which have been burdened by these additional requirements, EPA proposes to add these requirements "in order to demonstrate that no ISR contaminants cross the aquifer exemption boundary into the surrounding USDWs at a concentration above the baseline water quality limits of the USDW outside of the aquifer exemption boundary" (page 99-100 of the fact sheet). Given that no evidence is cited supporting the need for additional requirements for the Dewey-Burdock Project compared to other ISR facilities, the groundwater restoration and excursion monitoring requirements imposed by NRC after reviewing Powertech's NRC license application for 5 years are sufficient to ensure that there will be no measurable impacts to groundwater quality outside of the exempted aquifer that would impact the usability of the non-exempt waters. This is demonstrated by the examples listed in the previous comment.

G-3
The unprecedented requirements included in the draft permit are a significant departure from previous EPA Region 8, Underground Injection Control (UIC) Program reviews and approvals for ISR aquifer exemptions in adjacent Wyoming. The Dewey-Burdock Project is in a similar hydrogeologic setting to Wyoming ISR projects and borders the Wyoming/South Dakota state line. EPA's role in Wyoming is to approve UIC program revisions designating exempted aquifers after Wyoming DEQ has reclassified the aquifer and submitted a program revision to EPA Region 8. In support of the reclassification and designation of the mining aquifer, permittees are required to assemble information that includes: hydrogeologic data (subsurface depths, vertical confinement, thickness, area to be exempted, water quality analysis, etc.) and, more importantly, aquifer protection measures including: mineralogy, geochemistry, wellfield description and groundwater monitoring plan (Exhibit 004 at PDF pages 156-161). Aquifer protection measures as part of the groundwater monitoring plan are consistent across Wyoming operations. The EPA Region 8 UIC Program reviews the program revisions from Wyoming DEQ and supporting documents and, in all cases, has approved them as non-substantial program revisions <u>without conditions or stipulations</u> (**Exhibit 005**).
This is illustrated in the record of decision issued by the EPA Region 8 UIC Program for the Jane Dough Amendment to the Nichols Ranch ISR Project (Exhibit 006). The program revision approval notes that it "applies to the location and the injection activities described herein." Further, it acknowledges that "WDEQ has also demonstrated that fluids injected or mobilized will remain within the [designated] aquifer exemption boundary" (**Exhibit 006 at 3**).
Powertech's groundwater protection measures approved in its NRC license are virtually identical to those approved in adjacent Wyoming operations and were reviewed by the very same group at EPA Region 8 with far different outcomes. Powertech's draft permit includes extraordinary conditions and technically infeasible stipulations, **none of which were imposed by EPA Region 8 on other ISR projects during the approval process.** These other ISR projects include: Lost Creek ISR Project, Nichols Ranch ISR Project (including the recent Jane Dough amendment), Ross ISR Project and the Reno Creek ISR Project, all of which were reviewed and approved in the same general timeframe as the Dewey-Burdock draft permit was developed by EPA. **This arbitrary lack of consistency within EPA Region 8 and, more importantly, within the UIC Program at EPA Region 8 is unjustified** given that there have been no changes to the regulations or associated guidance from EPA during this period and the technical attributes (excursion monitoring, groundwater restoration, etc.) of the Wyoming ISR Projects and the Dewey-Burdock Project are virtually identical. The draft permit is an unveiled attempt to take an arbitrary approach and drastically change the way the ISR industry is regulated far in advance of the proposed rule changes, giving Wyoming ISR operators a clear business advantage over a similar project located just across the state border in South Dakota.

G-4
EPA considers contaminants to include "any physical, chemical, biological, or radiological substance or matter in water" regardless of whether the contaminant has the potential to impact human health or the environment (fact sheet page 104). Powertech disagrees with EPA's definition of what would constitute a violation of UIC regulations on the basis of 40 CFR 144.12(a), which states (emphasis added):
No owner or operator shall construct, operate, maintain, convert, plug, abandon, or conduct any other injection activity in a manner that allows the movement of fluid containing any contaminant into underground sources of drinking water, <u>if the presence of that contaminant may cause a violation of any primary drinking water regulation under 40 CFR part 142 or may otherwise adversely affect the health of persons.</u> The applicant for a permit shall have the burden of showing that the requirements of this paragraph are met.

This regulation is consistent with the purpose of the Safe Drinking Water Act (SDWA) and the UIC program, which is to protect USDWs. Imposing permit conditions to verify that non-hazardous parameters such as calcium, which does not have the potential to violate a drinking water regulation or otherwise affect the health of persons, do not cross the aquifer exemption boundary would not provide any added protection for USDWs. Additionally, the presence of a contaminant regulated under 40 CFR part 142 at a concentration below the federal maximum contaminant level (MCL) would not have the potential to adversely affect human health. This is exactly why the MCLs were established.

EPA's statement in the fact sheet for the draft permit that "UIC regulations at 40 CFR § 144.12(b) prohibits movement of any contaminant into an underground source of drinking water" is incorrect. The non-endangerment standard of the SDWA prohibits fluid movement from injection only insofar as it would cause a failure of a public water system to comply with health-based limits for contaminants.[5] Moreover, the meaning of this requirement is plain on the face of the statutory provision and requires no further interpretation.

Footnote 5: Miami-Dade County v. U.S. E.P.A., 529 F.3d 1049, 1064 (11th Cir. 2008): "despite this evidence that the statutory language was intended for liberal construction, no mention is made of a blanket no-fluid-movement standard.

The fluid movement prohibition applicable to the UIC program is set forth in the SDWA, which directs EPA to establish "minimum requirements for effective programs to prevent underground injection which endangers drinking water sources within the meaning of subsection (d)(2) [of this section]." See 42 U.S.C. § 300h(a)(1) and (b)(1). Under the UIC program, underground injection is prohibited unless authorized by a permit or by rule. 42 U.S.C. § 300h(b)(1)(A). To obtain an underground injection permit, applicants "must satisfy the State that the underground injection will not endanger drinking water sources." 42 U.S.C. § 300h(b)(1)(B). The applicable standard for "non-endangerment" is spelled out in subsection (d)(2):

Underground injection endangers drinking water sources if such injection may result in the presence in underground water which supplies or can reasonably be expected to supply any public water system of any contaminant, and if the presence of such contaminant may result in such system's not complying with any national primary drinking water regulation or may otherwise adversely affect the health of persons.

EPA's regulations establish the general fluid movement limitation in 40 CFR §§ 144.12(a) and 144.1(g), which closely track the language of the statute:

No owner or operator shall construct, operate, maintain, convert, plug, abandon, or conduct any other injection activity in a manner that allows the movement of fluid containing any contaminant into underground sources of drinking water, if the presence of that contaminant may cause a violation of any primary drinking water regulation under 40 CFR part 142 or may otherwise adversely affect the health of persons.

40 CFR § 144.12(a) (emphasis added).

In carrying out the mandate of the SDWA, this subpart provides that no injection shall be authorized by permit or rule if it results in the movement of fluid containing any contaminant into underground sources of drinking Water (USDWs - see § 144.3 for definition), if the presence of that contaminant may cause a violation of any primary drinking water regulation under 40 CFR part 141 or may adversely affect the health of persons (§ 144.12).

40 CFR § 144.1(g) (emphasis added).

These provisions adopt the statutory non-endangerment standard into the regulations. They clearly condition the prohibition of fluid movement on the potential to cause endangerment of an underground source of drinking water.[6] All other provisions in the UIC regulations must be read in light of this overarching standard that defines what fluid movement is prohibited.

Footnote 6: EPA Region IV's Regional Counsel acknowledged this very limitation in a memorandum clarifying the interaction of the UIC and RCRA regulations. Specifically, the Region stated:

Due to the conformance of the subsection (a) language with the statutory language, it may be summarized that the rule of § 144.12(a) is violated if injected material may enter either a present or potential underground source of drinking water USDW, and if, after such entry, it may pose a threat to human health or render the water source unfit for human consumption.

See EPA Region IV, Memorandum of Law from Jay Sargent, Regional Counsel, to Paul J. Trainer, Director, Water Management Division, "Response for Clarification of UIC Regulations and Their Interaction with RCRA Regulations," at 3-4, November 29, 1984. ("Region IV Memorandum").

The regulatory history of the "non-endangerment" standard shows that EPA never decided to impose an absolute prohibition on fluid movement. When EPA proposed its implementing regulations, the Agency decided to try to spell out a definition in the regulations "to clarify what is meant by 'endangerment.'" 41 Fed. Reg. 36730, 36731 (August 31, 1976). In so doing, the Agency provided its interpretation of the statutory non-endangerment standard. EPA stated that "[i]n the case of existing system using an underground water source, the logical meaning of this provision is that contamination endangers drinking water if it requires the use of new or additional treatment by the [public water] system to meet a national primary drinking water regulation or otherwise to prevent a health risk." 41 Fed. Reg. at 36733. Similarly, EPA concluded that "[i]n the case of a potential source of underground water which will require treatment if it is used in the future, degradation may make further treatment necessary or may make the water unsuitable for use as drinking water." Id. For contaminants other than those covered by national drinking water regulations, EPA concluded that the question of endangerment remained focused on how the presence of such contaminants in the potential water source would affect the ability of the water to be used as drinking water following whatever treatment would have been necessary absent consideration of that contaminant. Thus, endangerment would occur if the contamination would render the water unfit for use as drinking water or if, for a chemical not covered or likely to be covered by drinking water regulations, "the contamination of an underground drinking water source by that chemical could adversely affect the health of persons who obtain the drinking water from that source." Id. Although EPA ultimately chose to allow the statutory definition of "endangerment" to speak for itself without further definition in the UIC regulations, EPA did not repudiate its own interpretation of what is required by the statutory non-endangerment standard.[7]

Footnote 7: Indeed, the Region IV Memorandum confirms that EPA continued to adhere to this interpretation after the final UIC regulations were promulgated in 1982.

After receiving public comment on its 1976 proposal, the Agency decided to change course, concluding that "its proposed definition was unduly vague and confusing." 44 Fed. Reg. 23740 (April 20, 1979). EPA "decided that since 'endangerment' is defined in the Act, it need not be redefined in these regulations." 44 Fed. Reg. 23753 (April 20, 1979). Thus, the only definition of "endangerment" is the statutory definition quoted above.

Instead of writing a new definition of "endangerment" in its UIC regulations, EPA developed "an operational test." Id. But this test was not intended to change the standard:

EPA still intends to accomplish the statutory goal of 'preventing endangerment to underground sources of drinking water' – no change in this regard is contemplated. Rather our intention has been to fashion a test of 'endangerment' that is workable and reduces uncertainty.
44 Fed. Reg. 23740 (April 20, 1979). EPA described the proposed test as follows:
The test in these reproposed regulations is whether injection operations will cause the migration of injected or formation fluids into an underground source of drinking water. If injection into a well can cause such migration, the owner/operator must take appropriate action to eliminate the fluid migration. [Id.]
EPA explained that this "'no migration' standard was applicable to wells in Classes I-III, which were to achieve it through the use of sound engineering practices." 45 Fed. Reg. 42476 (June 24, 1980). "The technical requirements of Part 146 are designed to insure that such movement will not occur." 45 Fed. Reg. 33436 (May 19, 1980).
The standard was spelled out in 40 CFR § 122.34(a) (the predecessor to section 144.12(a)):
(a) No UIC authorization by permit or rule shall be allowed in the following circumstances: (1) Where a Class I, II, or III well causes or allows movement of fluid into underground sources of drinking water.
EPA later called this standard "a blanket prohibition … against movement of fluid into underground sources of drinking water for Class I, II, or III wells." 46 Fed. Reg. 48246 (October 1, 1981).
If this had been the end of the rulemaking process, there might have been more support for EPA's assertion in the fact sheet. But this was not the end of the rulemaking process, and that is not what EPA's UIC regulations now prescribe as the fluid movement limitation applicable to Class III wells.
In response to petitions for judicial review of the final UIC regulations, EPA revised the regulations on February 3, 1982 (47 Fed. Reg. 4996-97) to eliminate the blanket "no migration" prohibition. EPA chose, instead, to adopt the present wording that is anchored in the statutory standard for assuring that underground injection will not "endanger" drinking water sources:
In carrying out the mandate of the SDWA, this subpart provides that no injection shall be authorized by permit or rule if it results in the movement of fluid containing any contaminant into Underground Sources of Drinking Water (USDWs – see § 144.3 for definition), <u>if the presence of that contaminant may cause a violation of any primary drinking water regulation under 40 CFR part 141 or may adversely affect the health of persons (§ 144.12).</u>
40 CFR § 144.1(g) (originally promulgated as § 122.31(d)) (emphasis added). This fluid movement standard is founded on the statutory SDWA "non-endangerment" standard. Accordingly, EPA lacks legal authority to impose a more stringent prohibition on fluid movement than is contained in the SDWA and its own regulations.

Finally, the courts have rejected any notion of prohibiting insignificant risks, such as the movement of innocuous contaminants. As already explained, the Supreme Court has concluded the necessity of determining before taking administrative action "that it is reasonably necessary and appropriate to remedy a significant risk of material health impairment." IUD v. API at 639. Similarly, the U.S. Court of Appeals for the District of Columbia Circuit has said "something is "unsafe" only when it threatens humans with "a significant risk of harm." Natural Resources Defense Council, Inc. v. USEPA, 824 F.2d 1146, 1153 (D.C. Cir. 1987). Drawing on the analysis in that case, the action proposed here, which clearly is directed at prohibiting the movement of all contaminants from an exempted portion of an aquifer into a USDW is unwarranted because EPA "has made no finding with respect to the effect of the [potential movement of contaminants] on health." 824 F.2d at 1163. Here "endangerment" is clearly defined in terms of health. That means EPA "should consider differences in degrees of significance rather than simply a total elimination of all risks." IUD v. API at 643, n.48. An absolute fluid movement prohibition, by contrast, is aimed at the elimination of all risks rather than those found to be endangering and is therefore unsupportable.

Moreover, 40 CFR § 144.12(b) by its terms indicates that additional corrective action, operation, monitoring, or reporting may be imposed only if monitoring within the USDW indicates the movement of a contaminant into the USDW. All of the proposed additional monitoring requirements would occur within the exempted aquifer, which would be permanently removed from classification as a USDW. Additional monitoring requirements are not warranted unless an impact is documented in an adjacent non-exempted USDW.

G-5

The proposed additional permit requirements are not based on any final rulemaking, which would be the appropriate venue to change the way that the U.S. ISR industry is regulated. Since EPA does not cite any site-specific concerns with the Dewey-Burdock Project as the basis for the proposed additional permit requirements, Powertech must conclude that EPA has determined that these additional monitoring requirements are appropriate for the ISR industry generally. To promulgate additional permit requirements without a federal rulemaking contravenes the purpose of federal regulation. As noted above, there are many aspects of the previously proposed but discarded 40 CFR part 192 rulemaking that are now proposed as draft permit conditions despite the fact that the rulemaking was discarded. Some of these are summarized in Table G-1.

Table G-1: Proposed Permit Requirements Apparently Stemming from Previously Proposed but Discarded 40 CFR Part 192 Rulemaking

Proposed Requirement	Draft Permit Section	40 CFR Part 192 Section (Exhibit 007)
Post-restoration groundwater monitoring for at least 30 years under natural groundwater gradient[1]	Part IX, Sec. E	§ 192.53(e) (p. 4187), which would have required post-restoration monitoring for 30 years, or at least 3 years with geochemical modeling
Geochemical modeling if column testing does not conclusively demonstrate attenuation of all contaminants	Part IV, Sec. D.1.e	§ 192.53(e)(iii) (p. 4187), which would have allowed post-restoration groundwater monitoring duration to be shortened based on geochemical modeling using site-specific data
Monitoring for an extensive list of parameters in the event that an excursion is confirmed	Part IX, Sec. C.3.f Part IX, Sec. C.4.b.ii	§ 192.53(b)(2) (p. 4186), which would have required immediate sampling of all Table 1 constituents if an excursion is detected
Quarterly pre-operational baseline sampling for down-gradient compliance boundary monitoring wells	Part IV, Sec. C.1 Part IX, Sec. B.3	§ 192.53(a)(4) (p. 4186), which would have required at least one year of pre-operational background monitoring for all monitoring wells

Notes:

[1] Refer to Attachment A-3, which shows that the minimum time required for groundwater to reach down-gradient compliance boundary monitoring wells installed 200 feet from the wellfield would be 33 years.

G-6

The NRC staff prepared the Supplemental Environmental Impact Statement (SEIS) for the Dewey-Burdock Project, which evaluated potential impacts to groundwater outside of the exempted aquifer (**Exhibit 008**). As noted on page 5 of the Draft Cumulative Effects Analysis, **EPA reviewed the draft and final NRC SEIS**. However, at no time did EPA comment that the groundwater protection measures required by NRC were insufficient to protect groundwater outside of the exempted aquifer. EPA offers no evidence that impacts have occurred at other ISR facilities as a basis for the proposed post-restoration groundwater monitoring, column testing and additional excursion monitoring and corrective action requirements. Accordingly, those proposed conditions are wholly unsupported and should be deleted.

G-7

Powertech submitted the Class III permit application in December 2008, which means that EPA took more than 8 years to develop the draft permit. However, Powertech was never informed of the proposed permit conditions that extend significantly beyond – **and are inconsistent with** – NRC license requirements, including, but not limited to, post-restoration groundwater monitoring, column testing and additional excursion monitoring and corrective action requirements. Had Powertech had the opportunity to comment on a preliminary draft permit or otherwise discuss the draft conditions with EPA, it would have been possible to avoid some technical pitfalls in the proposed permit conditions. For example, the proposal to conduct post-restoration groundwater monitoring until after the arrival of a tracer injected at the upgradient edge of the wellfield would involve 400 to 800 years of monitoring under natural groundwater flow conditions. **Clearly such a condition is not a practical means of demonstrating a lack of negative impact to down-gradient USDWs.**

G-8

The draft permit contains inconsistent conditions that overlap with NRC license requirements. Some examples include:

1) Excursion monitoring during ISR operations (Part IX, Section C.1)
2) Excursion monitoring during groundwater restoration (Part IX, Section C.2)
3) Corrective actions during a confirmed excursion event (Part IX, Section C.3)
4) Annual monitoring of domestic wells within the Area of Review (Part IX, Section B.5.a)
5) Quarterly sampling of stock wells within the permit area (Part IX, Section B.4.b)
6) Quarterly monitoring of additional monitoring wells located upgradient and down-gradient of the ISR wellfields in accordance with NRC regulatory guidance (Part IX, Section B.4.c)
By specifying the monitoring well locations, sampling frequency and parameters for all of these overlapping monitoring requirements, Powertech will have to modify both the NRC license and Class III Area Permit if a monitoring location changes (e.g., if a new domestic well is drilled near the permit area). EPA also proposes to significantly alter the parameter list for most groundwater samples, which would lead to confusion for Powertech and regulators in having to submit samples to a laboratory for two different analyte lists.
G-9
EPA does not have the authority for proposing duplicative and in many cases expansive requirements for areas already regulated by NRC (especially excursion monitoring within the exempted aquifer).
Congress amended the Atomic Energy Act of 1954 (AEA) with the Uranium Mill Tailings Radiation Control Act (UMTRCA) in 1978 to specifically address a new class of AEA materials known as 11e.(2) byproduct material. As mandated by Congress, EPA was granted limited and indirect regulatory authority to propose generally applicable standards that would serve as the starting point for the NRC to promulgate regulations that would address such byproduct material and the process known as "uranium milling." NRC and not EPA was granted direct regulatory authority over this to implement and enforce appropriate regulations consistent with EPA's generally applicable standards. However, while EPA was allowed to promulgate such standards, it has no authority to create the applicable regulations, to impose requirements on NRC's licensees or to enforce NRC license requirements on such licensees.
Pursuant to Section 275 of the AEA, Congress assigned EPA the authority to promulgate generally applicable standards for the protection of public health and safety and the environment from the potential radiological and non-radiological hazards associated with the possession, transfer, and disposal of 11e.(2) byproduct material. 42 U.S.C. § 2022(b). For the non-radiological hazards associated with 11e.(2) byproduct material, these generally applicable standards are to provide equivalent protection to that provided by EPA's RCRA standards for such non-radiological hazardous materials. See 40 CFR § 264 et seq. As a result, 11e.(2) byproduct material is specifically exempted from EPA regulation under RCRA and permitting authority over such material is deliberately withheld from EPA. See 40 CFR § 261.4.

More specifically, Section 275(d) of the AEA provides that "[i]mplementation and enforcement of the standards promulgated [by EPA] pursuant to subsection (b) of this section shall be the responsibility of the Commission in the conduct of its licensing activities under this Act." In addition, Congress expanded NRC's regulatory authority under Section 84 of the AEA to develop its own requirements for the management of 11e.(2) byproduct material. Specifically, Section 84(a) of the AEA directs NRC to ensure that any 11e.(2) byproduct material is managed in a manner:
(i) that the Commission deems appropriate to protect health, safety, and the environment from the potential radiological and non-radiological hazards associated with such materials;
(ii) that conforms with the generally applicable standards developed by EPA; and
(iii) that conforms with the general requirements established by NRC, comparable to standards applicable to similar hazardous materials regulated under the Solid Waste Disposal Act [42 U.S.C. § 6901 et seq.].
By way of example, NRC's 10 CFR Part 40, Appendix A, Criterion 5 incorporates the basic groundwater protection standards as promulgated by EPA in 40 CFR Part 192, Subparts D & E, which, as noted above, incorporate RCRA standards in 40 CFR Part 264 et seq., and which apply both during operations and to final closure. The primary standard in Criterion 5 focuses on the type of liner necessary to protect groundwater during the management of uranium or thorium mill tailings. Additionally, a secondary groundwater standard is provided requiring that hazardous constituents entering groundwater must not exceed concentration limits in the "uppermost aquifer beyond the point of compliance during the compliance period." Criterion 5 prescribes a specific course of action for implementing primary and secondary groundwater standards, which include provisions for alternate concentration limits (ACLs), the classification of hazardous constituents and whether they may be exempted from the regulation. But, EPA is not allowed to prescribe the requirements for obtaining an ACL from NRC and has so conceded that point on multiple occasions.
With respect to ISR operations such as the Dewey-Burdock Project, in the 1980s, the Commission determined that the active operational portion of such an operation constitutes "uranium milling" and therefore falls under the provisions of UMTRCA. Later, in 2000, the Commission determined that restoration fluids from ISR operations are 11e.(2) byproduct material as well as determining that it had exclusive, preemptive federal jurisdiction under the AEA/UMTRCA over both the radiological and non-radiological aspects of 11e.(2) byproduct material and, thus by definition, "uranium milling." As a result of these decisions, the Commission later determined that Appendix A Criteria, including Criterion 5 groundwater corrective action requirements, are to be applied to ISR wellfields as a matter of law, despite the fact that ISR licenses up to that point included license conditions mandating groundwater restoration in such wellfields. As a result of this determination, which has never been challenged by EPA or any other entity, the Commission fully regulates all aspects of ISR operations, including but not limited to groundwater restoration.

Interestingly enough, EPA's SDWA UIC regulations do not require post-operation groundwater restoration for exempted aquifers, because such exempted aquifers will not be used as a drinking water source at any time before, during or after ISR operations are complete. In some cases, states such as Wyoming, Texas and Nebraska through their "primacy" UIC programs have created regulations for groundwater restoration of depleted underground ISR ore bodies to specified standards, including class-of-use. While EPA does not require restoration, the agency's UIC regulations do prohibit the injection of fluids that result in the migration of such fluids to adjacent, non-exempt USDWs, if such migration may cause a violation of any primary drinking water regulation or may adversely affect the health of persons, and do require corrective action/remediation for contamination of adjacent, non-exempt aquifers in accordance with the purpose of the SDWA and the UIC program, which is to protect USDWs. See 40 CFR §§ 144.55 and 146.7.
It is completely unnecessary for EPA to impose duplicative regulatory requirements on ISR projects, especially where the Commission already imposes detailed wellfield monitoring programs that specifically prohibit the migration of production or restoration fluids outside of the perimeter monitoring well ring, which is designed to serve as an early warning system for such potential migration. Powertech is required by Commission regulation to submit detailed wellfield packages to NRC for review and in some cases either written verification or specific approval, which include the proposed monitoring program and commitments to immediately engage in corrective action if identified constituents are found at a perimeter monitoring well. Further, after termination of active operations, groundwater restoration must be conducted in accordance with Criterion 5 requirements, which are Commission-approved background or an MCL, whichever is higher, or an ACL as determined by the Commission using an exhaustive list of approximately 13 separate requirements. Also, an ACL will not be granted by the Commission unless it is determined to be adequately protective of public health and safety, is demonstrated to show that there are no steadily increasing trends of constituents of concern that may indicate the potential for future excursions to adjacent, non-exempt aquifers, and that the Commission's as low as reasonably achievable (ALARA) standard has been met. In accordance with the ACL requirements, Powertech must demonstrate that the ACL value and the geochemistry in the depleted ore body and down-gradient areas will be adequately protective of human health and the environment at the point of exposure (POE), which is the aquifer exemption boundary (**Exhibit 009 at 13**).
Based on the success with this regulatory program, the Commission directed NRC staff to conduct a study of its licensed ISR projects, past and present, to determine if there has ever been migration of ISR ore body fluids to adjacent, non-exempt aquifers. As described in comment #G-1, in 2009, NRC staff completed its inquiry and reported that no such migrations had ever taken place. Therefore, EPA's imposition of otherwise duplicative and, in many cases, onerous requirements on Powertech for groundwater monitoring and corrective action in the face of NRC's regulatory program is improper.
G-10
Regarding the proposed post-restoration monitoring and column testing requirements, EPA does not appear to have considered the ACL approval process required under NRC regulation and license condition for any constituents exceeding the baseline concentration or an MCL after groundwater restoration. In order to approve an ACL application through a formal license amendment process, NRC must determine that there will be no migration of recovery solutions outside of the aquifer exemption boundary. Additional information is found in Attachment A-3. In light of the groundwater quality standards in 10 CFR Part 40, Appendix A, Criteria 5B(5) and 5B(6), there is no need or technical justification for additional post-restoration monitoring and column testing, which would create an unjustified economic burden.

G-11
EPA acknowledges the effectiveness of the excursion monitoring system that will be conducted under NRC license requirements on page 116 of the fact sheet:
The monitoring well detection system described in Section 12.5 is a proven method used at historically and currently operating facilities.
In spite of this acknowledgement, EPA proposes significant revisions to the excursion monitoring program such as monitoring for a potential "expanding excursion plume" and a "remnant excursion plume," neither of which has been documented in the fact sheet to have occurred at a historically operated ISR facility.

G-12
Powertech is unaware of any Class III permits for uranium ISR operations in the U.S. for which similar conditions have been imposed for post-restoration groundwater monitoring, column testing and additional excursion monitoring and corrective action requirements. This includes Class III permits issued by the State of Wyoming within the last 10 years for the Lost Creek ISR Project, Ross ISR Project, North Butte ISR Project, Nichols Ranch ISR Project, Moore Ranch ISR Project and Reno Creek ISR Project. It also includes Class III permits issued or amended in 2017 for the Nichols Ranch ISR Project (Jane Dough Amendment) and Burke Hollow ISR Project in Texas.

G-13
It is noted that some historical and recent ISR projects (e.g., the Cameco Resources Crow Butte ISR Project and the UEC Burke Hollow ISR Project) received aquifer exemptions for the majority of the permit area. Powertech originally proposed an aquifer exemption boundary at a reasonable distance from the ISR wellfields (1,600 feet from the injection and production wells), which was consistent with WDEQ, Land Quality Division Chapter 11 regulations. This would have provided an operational buffer for adjusting wellfield boundaries based on delineation drilling and for ensuring that ISR solutions remain within the exempted aquifer. At EPA's request, Powertech revised the proposed aquifer exemption boundary to only include a very narrow buffer area extending 120 feet from the perimeter monitoring well ring for the proposed wellfields. Many of the proposed requirements in the draft permit, such as installing additional down-gradient compliance boundary monitoring wells if a statistically significant increase is observed during post-restoration groundwater monitoring, would fit within a larger aquifer exemption buffer area. However, these requirements are poorly suited to the relatively small area currently proposed. When Powertech proposed the 120-foot offset distance at EPA's request, it was unaware of the proposed permit conditions that would make this narrow buffer area operationally challenging. Accordingly, EPA should approve the ¼-mile buffer in the designation of the exempted aquifer if the proposed permit conditions are imposed, as described in **Attachment A-10**.

G-14
Despite citing no evidence that any impacts outside of the exempted aquifer have ever occurred at a domestic ISR facility and no evidence that there are site-specific conditions at the Dewey-Burdock Project that warrant additional monitoring and corrective actions, the draft permit would impose millions of dollars in additional well installation, monitoring, column testing, laboratory analysis and other costs such as maintaining lease agreements with affected landowners for decades or even hundreds of years and maintaining financial responsibility for virtually the entire project for this same duration. This is illustrated in Table G-2, which provides an estimated cost for the additional proposed requirements beyond current NRC license requirements.

Table G-2. Itemized Life-of-Mine Cost Estimate for Proposed Permit Requirements beyond NRC License Requirements

Item	Life-of-Mine Cost Estimate
Groundwater Monitoring – Laboratory Analysis[1]	$13,102,600
Groundwater Monitoring – Sample Collection	$3,565,900
DGCB Monitoring Well Installation	$4,326,500
DGCB Monitoring Well Reclamation	$507,400
Core Collection and Storage	$224,000
Core Leach Testing	$571,600
Geochemical Modeling	$2,800,000
Contingency at 20%	$5,019,600
Total Life-of-Mine Cost[2]	**$30,117,600**

Notes:

[1] Includes DGCB monitoring wells plus additional laboratory analysis costs for analyzing non-injection interval monitoring wells, nearby domestic wells, operational monitoring wells, and other water samples for the Table 8 list of parameters rather than the NRC-approved list of parameters in Table 6.1-1 of the approved NRC license application.

[2] Uses a very conservative assumption of 6 years of post-restoration groundwater monitoring for each wellfield, assuming pumping of DGCB monitoring wells and then monitoring for two 2-year periods after arrival of the tracers injected at the down-gradient and upgradient wellfield boundary. Does not include added cost for maintaining financial responsibility and maintaining lease agreements for several additional years.

The cost estimate is based on well estimates and unit cost estimates from the most recent economic study of the project: NI 43-101 Technical Report, Preliminary Economic Assessment, Dewey-Burdock Uranium ISR Project, April 2015 (Exhibit 026). The estimate uses a very conservative assumption of 6 years of post-restoration groundwater monitoring, assuming pumping of DGCB monitoring wells and then monitoring for two 2-year periods after arrival of the tracers injected at the down-gradient and upgradient wellfield boundary. As described in Attachment A-3, the duration of post-restoration groundwater monitoring under natural groundwater flow conditions could be hundreds of years, which would have an exponential impact on this cost estimate.

The Draft Cumulative Effects Analysis extends well beyond EPA's regulatory requirement under 40 CFR § 144.33(c)(3). That requirement allows authorization for multiple injection wells under an area permit provided that "[t]he cumulative effects of drilling and operation of additional injection wells are considered by the Director during evaluation of the area permit application and are acceptable to the Director" (emphasis added). Many aspects of the Draft Cumulative Effects Analysis do not relate to drilling and operation of the Class III or V injection wells, including: potential groundwater consumption and drawdown, which are only related to production wells and Madison water supply wells (Sections 3.1 and 3.2), potential effects of storage ponds on groundwater quality (Section 3.3.4), potential impacts from spills and leaks other than those from injection wells (Sections 3.3.5, 5.0 and 5.7), diversion channels around ponds and facilities (Section 4.2.3), potential impacts from land application for treated wastewater (Sections 4.7.2 and 7.3), potential pipeline leaks (Section 5.1), potential header house leaks (Section 5.2.1), potential processing facility leaks (Section 5.3), potential transportation accidents (Section 5.5), potential pond leaks (Section 5.6), potential land use impacts other than those related to injection wells (Section 6.0), potential radiological impacts (Section 9.0), potential air quality impacts other than those related to construction and operation of Class III and V injection wells (Section 10.0), potential climate change impacts other than those related to construction and operation of Class III and V injection wells (Section 11.0), potential transportation impacts (Section 12.0), potential impacts from accidents (Section 13.0) and potential impacts from waste management (Section 15.0). Such a cumulative effects analysis is not provided for under UIC regulations and should not be included in the draft permit documents.

G-15

The Draft Cumulative Effects Analysis extends well beyond EPA's regulatory requirement under 40 CFR § 144.33(c)(3). That requirement allows authorization for multiple injection wells under an area permit provided that "[t]he cumulative effects of drilling and operation of additional injection wells are considered by the Director during evaluation of the area permit application and are acceptable to the Director" (emphasis added). Many aspects of the Draft Cumulative Effects Analysis do not relate to drilling and operation of the Class III or V injection wells, including: potential groundwater consumption and drawdown, which are only related to production wells and Madison water supply wells (Sections 3.1 and 3.2), potential effects of storage ponds on groundwater quality (Section 3.3.4), potential impacts from spills and leaks other than those from injection wells (Sections 3.3.5, 5.0 and 5.7), diversion channels around ponds and facilities (Section 4.2.3), potential impacts from land application for treated wastewater (Sections 4.7.2 and 7.3), potential pipeline leaks (Section 5.1), potential header house leaks (Section 5.2.1), potential processing facility leaks (Section 5.3), potential transportation accidents (Section 5.5), potential pond leaks (Section 5.6), potential land use impacts other than those related to injection wells (Section 6.0), potential radiological impacts (Section 9.0), potential air quality impacts other than those related to construction and operation of Class III and V injection wells (Section 10.0), potential climate change impacts other than those related to construction and operation of Class III and V injection wells (Section 11.0), potential transportation impacts (Section 12.0), potential impacts from accidents (Section 13.0) and potential impacts from waste management (Section 15.0). Such a cumulative effects analysis is not provided for under UIC regulations and should not be included in the draft permit documents.

G-16

Powertech is frustrated by the amount of time that it has taken EPA to review the draft permit applications and requests that EPA expedite efforts moving forward to the extent possible. Powertech submitted the Class III UIC permit application in December 2008, and it was determined to be administratively complete in February 2009, more than 8 years ago. Powertech updated the application in July 2012 to be consistent with the updated NRC license application, and in February 2014 EPA indicated that it intended to announce its draft permit decisions in April 2014. Contrary to this statement and without issuing any more substantive comments to Powertech, it took another 3 years to issue the draft permit. Similarly, the Class V permit application was submitted in March 2010 and the draft permit was not issued until 7 years later. The amount of time taken by the EPA to review the permit applications has also caused undue financial burden to the Company. Going forward, Powertech requests that EPA take steps necessary and bring resources to bear to facilitate a more timely process of review of this application.
In conclusion, Powertech's primary concern is that the draft permit would impose a raft of unprecedented and wholly unwarranted new requirements for an ISR operation that would prove both operationally and financially burdensome. EPA has offered no sound scientific or factual justification for the imposition of these additional requirements. Many of the requirements are also untested and technically infeasible. Because these requirements would be uniquely imposed on Powertech, Dewey-Burdock operations would be subjected to a substantial economic and competitive disadvantage. In an effort to facilitate a constructive working relationship, Powertech has presented alternatives for certain permit conditions (Attachments A-1 through A-10). Although these alternatives include added monitoring, geochemical modeling, and corrective action provisions beyond those required by NRC and which would significantly add to the project cost, they would provide EPA with the necessary assurance that there is no endangerment to adjacent, non-exempt aquifers from the Dewey-Burdock Project.
Powertech appreciates the opportunity to provide these comments and would be happy to discuss them with EPA. We request that EPA give these comments full consideration and produce a revised permit that reflects the current regulations, technical situation and past permits, and we request that this be done within a reasonable time frame.
Table 1. Class III Draft Area Permit Specific Comments and Recommended Permit Language Revisions

Notes	Response
Ex. 5 Deliberative Process (DP)	

Exhibit 007 Exhibit 025	

Exhibit 001 at 2	
Exhibit 025 at 7404	

followed by...in the same paragraph: The Agency remains concerned, however, that the available data may not be capturing some instances of contamination that this proposed rule seeks to prevent. In other words, the Agency remains concerned that the lack of data does not demonstrate that no contamination is occurring, as industry commenters assert, but instead merely demonstrates the lack of data available to be able to make such a determination, especially where there has been limited post-restoration monitoring. The monitoring requirements in this proposal address the issue of lack of data.	
Exhibit 002 at 4-38	
Exhibit 003 at 22 **Ex. 5 Deliberative Process (DP)**	

Exhibit 005	
Exhibit 006 at 3	
Ex. 5 Deliberative Process (DP)	

Exhibit 008 **Ex. 5 Deliberative Process (DP)**	
Ex. 5 Deliberative Process (DP)	
Ex. 5 Deliberative Process (DP)	

Ex. 5 Deliberative Process (DP)	
ORC	
ORC	
ORC	

Exhibit 009 at 13	

Ex. 5 Deliberative Process (DP)	
Attachment A-10	

ermit Speci

No.	Page #
1	1
2	3
3	4 - 5
4	6
5	6

6 8

7 8 - 9

8	9
9	10
10	10

11 11

12 12

13 13

14 13

15 13

16 14-15

17 14-15

18	14-15
19	14-15

20	14-15
21	14-15
22	15

23	15-16
23 cont	15-16
23 cont	15-16

23 cont	15-16
23 cont	15-16
23 cont	15-16
24	17

25	19
26	21
27	23-28

28	28
28 cont	28
28 cont	28

28 cont	28
29	29
30	33

31 33

32 33

33	33
34	34
35	35
35 cont	35

36	5
37	37
38	40
39	41
40	43

41	43
42	44
43	44
44	45
45	45

46	6
47	46
48	46

49	47-49 51-57 66

49
cont

50 47

51 48

52

53 48

54	49
55	49

56	49
57	50
58	50

59	51
60	54
61	58
62	58

63 58

64 59

64
cont

65	59-60
66	60
67	61-63
68	61

69	61
70	61
71	62
72	64

73	65
74	66
75	67
76	72
77	73
78	7 (App B)
79	7 (App B)

Table 1. Class III Draft Area Permit Specific Comments and Recommended Permit Language Revisions

Recommended Alternative Language or Other Modification

I.A. Class III Permit Area Boundary

…Figure 2a shows the Dewey Area ore zones and wellfields in Sections 29, 30, 31, ~~and~~ 32 and 33 of Township 6 South, Range 1 East.…

I.B. Well Locations

… The UIC regulations specific to South Dakota are found at 40 CFR ~~§ 147.2100~~ part 147, subpart QQ…

Remove "Deep Class I Disposal Well #4" and "Deep Class I Disposal Well #2" from legend and plan view of Figures 2a and 2b, respectively.

II.A. Wellfield Location Restrictions

All wellfields and perimeter monitoring wells shall be located within the Permit Area boundary described in Part I. No ~~wellfields~~ Class III injection or production wells shall be located within 1,600 feet of the Permit Area boundary in order to establish an operational buffer between the wellfields and the Permit Area boundary.

Table 3. Example Cross Section Locations Required for Each Wellfield

D-WF2	A minimum of 1 cross section along trend of Middle and/or Lower Chilson roll fronts delineating Middle and/or Lower Chilson ore deposits approximately parallel to cross section J – J' as shown in Appendix A, Figure A1. A minimum of 1 cross section intersecting the first cross section also delineating Middle and/or Lower Chilson ore deposits located in the middle of the west side of D-WF2, as shown in Appendix A, Figure A1. The cross sections shall clearly identify aquifer units, confining units and Middle and/or Lower Chilson ore targeted by D-WF2. Also include any intersected ore zones targeted by D-WF1, D-WF3 and D-WF4 as applicable.

Table 3. Example Cross Section Locations Required for Each Wellfield

B-WF6	A minimum of the ~~9~~ 7 cross sections in the approximate locations shown in Appendix A, Figure A5 delineating Middle and/or Lower Chilson ore deposits. The cross sections shall clearly identify aquifer units, confining units and Middle and/or Lower Chilson ore deposits ore deposits targeted by B-WF6. Also include any intersected ore zones targeted by B-WF1 and B-WF7 as applicable.
B-WF7	A minimum of the ~~2~~ 1 cross section~~s~~ shown in Appendix A, Figure A5 delineating Middle and/or Lower Chilson ore deposits. The cross section~~s~~ shall clearly identify aquifer units, confining units and Middle and/or Lower Chilson ore deposits ore deposits targeted by B-WF7.

Table 3. Example Cross Section Locations Required for Each Wellfield

B-WF2	... The cross sections shall clearly identify aquifer units, confining units and Middle Chilson ore deposits ~~ore deposits~~ targeted by B-WF2...
B-WF4	... The cross sections shall clearly identify aquifer units, confining units and Middle
	and/or Lower Chilson ore deposits ~~ore deposits~~ targeted by B-WF4...
B-WF6	... The cross sections shall clearly identify aquifer units, confining units and Middle and/or Lower Chilson ore deposits ~~ore deposits~~ targeted by B-WF6...
B-WF7	... The cross sections shall clearly identify aquifer units, confining units and Middle and/or Lower Chilson ore deposits ~~ore deposits~~ targeted by B-WF7...
B-WF8	... The cross sections shall clearly identify aquifer units, confining units and Middle and/or Lower Chilson ore deposits ~~ore deposits~~ targeted by B-WF8...
B-WF10	... The cross sections shall clearly identify aquifer units, confining units and Lower Fall River ore deposits ~~ore deposits~~ targeted by B-WF10....

2.C. Wellfield Pump Test Design and Pump Test Well Installation

2.a. Identify ~~each~~ the proposed production and injection well ~~location~~ patterns and approximate screened intervals.

Table 4. Observation Wells for Monitoring the Integrity of the Morrison Formation Lower Confining Zone

ELT 14	SESE Section 30 T6S R1E	Dewey WF2	Hydro ID 693
DB08-32-11	NENW Section ~~29~~ 32 T6S R1E	Dewey WF2	NENW Section ~~29~~ 32 T6S R1E

Table 4. Observation Wells for Monitoring the Integrity of the Morrison Formation Lower Confining Zone

DRJ 90	SESE Section 35 T6S R1E ~~T6S R1E~~
DB08-1-7	SE Section ~~2~~ 1 T7S R1E

~~**II.D.5. Injection Zone Core Sample Collection from Monitoring Wells Located Down-gradient of Wellfields**~~

~~a. The Permittee shall collect a minimum of two (2) cores per wellfield through the proposed injection interval while drilling the down-gradient perimeter monitoring wells ring wells or the Down-gradient Compliance Boundary Wells.~~

~~b. Core shall be recovered and preserved in a manner to prevent further oxidation so as to be representative of in-situ geochemical conditions for use in columns tests as part of Post-Restoration Monitoring to verify that no ISR contaminants will cross the down-gradient aquifer exemption boundary.~~

II.E.2. The Permittee shall follow these procedures while conducting the formation testing described in Table 6:

a. Determination of Aquifer Potentiometric Surfaces

i. Once the potentiometric surface has stabilized within each aquifer after well development, static potentiometric surface water levels shall be measured in every perimeter and non-injection interval monitoring well and a representative number of injection or production wells ~~in every aquifer unit~~ in the wellfield~~, including injection, production and monitoring wells~~.

II.E.2. The Permittee shall follow these procedures while conducting the formation testing described in Table 6:

a. Determination of Aquifer Potentiometric Surfaces

iv. Once the potentiometric surface has stabilized within each aquifer after the pump test, static potentiometric water levels shall be measured in every perimeter and non-injection interval monitoring well and a representative number of injection or production wells ~~in every aquifer unit~~ in the wellfield~~, including injection, production and monitoring wells~~, prior to the initiation of injection into the wellfield to determine if there have been any changes in water levels not attributable to changes in barometric pressure.

II.E.2. The Permittee shall follow these procedures while conducting the formation testing described in Table 6:

b. Sampling and Analysis of Injection Interval and Non-injection Interval Monitoring Wells

i. After the construction and development of the wellfield perimeter monitoring wells ~~(and Down-gradient Compliance Boundary Wells)~~ completed within the injection interval and the monitoring wells completed in aquifers above and below (where applicable) the injection interval, the Permittee shall collect groundwater samples from each well according to the following procedures:

A) The Permittee shall ~~use the Standard Operating Procedure for Low-Stress (Low Flow) / Minimal Drawdown Ground-Water Sample Collection~~ purge at least three casing volumes prior to sample collection and measure the field parameters listed in Table 7 at the surface as fluid is pumped out of the well to determine when collection of a representative sample is possible.

Table 7. Field Parameters to be Monitored and Stabilization Criteria to Meet before Sample Collection

Parameter	Stabilization Criteria
pH	± ~~0.1~~ 10% pH units
Specific conductance	± ~~3~~10% µS/cm
Temperature	± 10% °C
~~Oxidation-reduction potential~~	~~± 10 millivolts~~
~~Turbidity~~	~~± 10 % NTUs when turbidity is greater than 10 NTUs~~
~~Dissolved oxygen~~	~~± 0.3 milligrams per liter~~

Table 8. Baseline Water Quality Parameter List

Test Analyte/Parameter[2]	Units
Physical Properties	
pH[3]	pH Units
Total Dissolved Solids (TDS)	mg/L
Specific Conductance[3]	µmhos/cm
Common Elements and Ions	
Total alkalinity (as $CaCO_3$)	mg/L
Bicarbonate Alkalinity (as $CaCO_3$)	mg/L
Calcium	mg/L
Carbonate Alkalinity (as $CaCO_3$)	mg/L
Chloride, Cl	mg/L
Magnesium, Mg	mg/L
Nitrate, NO_3^- (as Nitrogen)	mg/L
Potassium, K	mg/L
~~Silica, Si~~	~~mg/L~~
Sodium, Na	mg/L
Sulfate, SO_4	mg/L
~~Total~~ Dissolved Metals	
~~Aluminum, Al~~	~~mg/L~~
~~Antimony, Sb~~	~~mg/L~~
Arsenic, As	mg/L
Barium, Ba	mg/L
~~Beryllium, Be~~	~~mg/L~~
Boron, B	mg/L
Cadmium, Cd	mg/L
Chromium, Cr	mg/L
Copper, Cu	mg/L
Fluoride, F	mg/L
Iron, Fe	mg/L
Lead, Pb	mg/L
Manganese, Mn	mg/L

Mercury, Hg	mg/L
Molybdenum, Mo	mg/L
Nickel, Ni	mg/L
Selenium, Se	mg/L
Silver, Ag	mg/L
~~Strontium, Sr~~	~~mg/L~~
~~Thallium, Tl~~	~~mg/L~~
~~Thorium, Th~~	~~mg/L~~
Uranium, U	mg/L
Vanadium, V	mg/L
Zinc, Zn	mg/L
Radiological Parameters	
Gross Alpha[4]	pCi/L
~~Gross Beta~~	~~pCi/L~~
~~Gross Gamma~~	~~pCi/L~~
~~Lead 210~~	~~pCi/L~~
~~Polonium 210~~	~~pCi/L~~
Radium, Ra-226	pCi/L
~~Thorium 230~~	~~pCi/L~~

[2]Laboratory analysis only, except where indicated.
[3]Field and Laboratory
[4]Exlcuding radon and uranium
See comment #16.

See comment #16.

See comment #16.

See comment #16.

See comment #16.

II.F. Wellfield Pump Test Requirements

3. The Permittee shall conduct the wellfield pump tests with sufficient iterations and using pumping wells in as many locations within the wellfield as necessary to create drawdown in each injection interval perimeter monitoring well.

II.G. Additional Requirements to Obtain Authorization to Inject for Burdock Wellfields 6, 7 and 8

1. Because the Chilson Sandstone down-gradient from Burdock Wellfields 6, 7 and 8 has been partially oxidized by native groundwater, the Permittee shall evaluate the capacity of the down-gradient Chilson Sandstone to remove residual contamination from restored wellfield groundwater as it travels down-gradient toward the aquifer exemption boundary.

2. To fulfill this requirement the Permittee shall:

a. ~~Collect a minimum of two (2) cores per wellfield through the proposed injection interval while drilling the down-gradient perimeter monitoring wells ring wells or the Down-gradient Compliance Boundary Wells.~~ Conduct geochemical modeling using site-specific data to demonstrate that contaminants will not cross the down-gradient aquifer exemption boundary and cause a violation of any primary MCLs or otherwise adversely affect the health of persons.

b. ~~Core shall be recovered and preserved in a manner to prevent further oxidation so as to be representative of in-situ geochemical conditions.~~ Conduct column testing, batch sorption testing, or other approved laboratory or field testing method to provide site-specific inputs into the geochemical modeling, as specified in Part IV, Section D.1.a.

c. ~~Compile vertical composite samples from single cores and conduct at least two laboratory bench-scale column tests per wellfield on the composite samples. The two column tests shall be conducted using the following leachates:~~ Submit geochemical modeling results to the Director demonstrating that no ISR contaminants will cross the down-gradient aquifer exemption boundary and cause a violation of any primary MCLs or otherwise adversely affect the health of persons. ~~i. One column test shall be conducted using unrestored wellfield groundwater taken from a wellfield in which uranium recovery has been completed, but before groundwater restoration has begun, and~~
~~ii. The second column test shall be conducted using restored wellfield groundwater.~~

~~d. The column testing fluids shall be analyzed for the analytes in Table 8 before and after recovery from the column so that changes in analyzed constituent concentrations may be determined.~~
~~e. After the tests in Part II, Sections G.1.c.i and G.1.c.ii have been completed, a second round of tests shall be run on these same columns using groundwater collected from up-gradient perimeter monitoring wells to determine if any constituents adsorbed or precipitated on the column matrix during the Part II, Sections G.1.c.i and G.1.c.ii column tests are released into solution by the up-gradient groundwater leachate. The up-gradient groundwater samples shall be analyzed for constituents in Table 8 before and after recovery from the column test to determine if there is a statistically significant increase in analyzed constituent concentrations after leaching through the column.~~

~~f. If the Part II, Sections G.1.c.i and G.1.c.ii column test leachates do not demonstrate an adequate decrease in ISR contaminant concentrations after passing through the columns or the up-gradient perimeter monitoring well groundwater tests show an increase in contaminant levels after passing through the columns, then the Permittee shall submit a groundwater treatment plan to the Director describing measures for preventing ISR contaminants from crossing the down-gradient aquifer exemption boundary. The plan may include geochemical modeling results demonstrating that no ISR contaminants will cross the down-gradient aquifer exemption boundary. The geochemical model should be calibrated with laboratory and/or field data.~~

3. If, during the wellfield pump tests using a pumping rate simulating production and restoration in Burdock Wellfields 6, 7 or 8, the Chilson aquifer potentiometric surface is drawn down to the point where the proposed injection interval becomes less than fully saturated, the Permittee shall develop a 3-D unsaturated groundwater flow model for the area where less than fully saturated conditions are anticipated.

II.H. Injection Authorization Data Package Reports

2. Each Injection Authorization Data Package Report shall contain a description of all logging and testing procedures required under Part II, Sections B through F (Sections B through G for Burdock Wellfields 6, 7 and 8) and the results of such logs and tests. In summary, each Injection Authorization Data Package Report shall contain the following:

o. Estimation of wellfield maximum injection pressure calculated using the equation in Part V, Section F of this Permit and results from wellfield delineation drilling and logging for the purpose of selecting well casing and piping that meet requirements under Part VIII, Section~~s~~ ~~E.2.c and E.3.c~~ E.1.

II.I.3. Information to Submit to the Director to Obtain Approval of the Proposed Exemption of Inyan Kara Aquifers within the Proposed Aquifer Exemption Boundary around Burdock Wellfields 6 and 7
If the Permittee has not demonstrated to the Director that Well 16 located in NWSE Section 1 T7S R1E ~~has been plugged and abandoned~~ does not currently serve as a source of drinking water before issuance of the Final Class III Area Permit, the Permittee shall submit the following information to the Director for proposing exemption of the Inyan Kara aquifer within the proposed exemption boundary:
a. Injection Authorization Data Package Reports including all the information under Part II, Sections B through G and Section I. This information will serve as additional analysis of the amenability of the injection interval to the in-situ method for uranium recovery as required under § 144.7(c)(1).
b. A demonstration that Well 16 located in NWSE Section 1 T7S R1~~E has been plugged and abandoned~~ does not currently serve as a source of drinking water.

Modify or provide additional explanation as to the possible step rate test locations for the Dewey area depicted on Figure 4.

PART IV. ~~**DOWN-GRADIENT COMPLIANCE BOUNDARY BASELINE MONITORING AND POST-RESTORATION MONITORING PLAN GEOCHEMICAL MODELING REQUIREMENTS**~~
~~**A. Down-gradient Compliance Boundary Post-Restoration Monitoring Plan**~~
~~**B. The Post-Restoration Monitoring Plan Shall Meet the Following Requirements:**~~
~~**C. Determination of Baseline Constituent Concentrations to be used as Permit Limits for Post-Restoration Monitoring Wells**~~

IV.~~AD. Laboratory Column Testing~~ Geochemical Modeling to Verify Attenuation Capability of Down-gradient Injection Zone Aquifer

1. Once wellfield restoration and stability monitoring have~~s~~ been completed in a wellfield ~~and restored wellfield groundwater is available for use in the following laboratory tests~~, the Permittee shall ~~use the injection zone core samples collected as required under Part II, Section D.5 to conduct columns tests according to the following specifications~~ conduct geochemical modeling using site-specific data to demonstrate that contaminants will not cross the down-gradient aquifer exemption boundary and cause a violation of any primary MCLs or otherwise adversely affect the health of persons~~:~~.

~~**a. Compile vertical composite samples from single cores and conduct at least two laboratory bench-scale column tests per wellfield on the composite samples.**~~
~~**b. The two column tests shall be conducted using the following leachates:**~~
~~**i. One column test shall be conducted using unrestored wellfield groundwater taken from a wellfield in which uranium recovery has been initiated, but before groundwater restoration has begun, and**~~
~~**ii. The second column test shall be conducted using restored wellfield groundwater.**~~
~~**c. The column testing fluids shall be analyzed for the analytes in Table 8 before and after recovery from the column so that changes in analyzed constituent concentrations may be determined.**~~
~~**d. After the tests in Part IV, Sections D.1.b.i and D.1.b.ii have been completed, a second round of tests shall be run on these same columns using groundwater collected from up-gradient perimeter monitoring wells to determine if any constituents adsorbed or precipitated on the column matrix during the Part IV, Sections D.1.b.i and D.1.b.ii column tests are released into solution by the up-gradient groundwater leachate. The up-gradient groundwater samples shall be analyzed for constituents in Table 8 before and after recovery from the column test to determine if there is a statistically significant increase in analyzed constituent concentrations after leaching through the column.**~~

a. Geochemical modeling shall evaluate the following:
i. Demonstration of the restored aquifer's capacity to maintain stability, considering the long-term influence of up-gradient groundwater.
ii. Assessment of the natural capacity of the down-gradient portion of the exempted aquifer to attenuate contaminant concentrations.
iii. Evaluation of any localized, elevated concentrations above the restoration criteria remaining in the production zone following restoration.

be. ~~If the Part IV, Sections D.1.b.i and D.1.b.ii column test leachates show an insufficient decrease in ISR contaminant concentrations after passing through the columns or the up-gradient perimeter monitoring well groundwater tests show an increase in contaminant levels after passing through the columns, then t~~The Permittee shall submit a ~~groundwater treatment~~ Closure ~~p~~Plan to the Director for approval describing the geochemical modeling results ~~measures for preventing ISR contaminants from crossing the down-gradient aquifer exemption boundary~~. The plan shall ~~include geochemical modeling results~~ demonstrat~~eing~~ that no ISR contaminants will cross the down-gradient aquifer exemption boundary and cause a violation of any primary MCLs or otherwise adversely affect the health of persons. The geochemical model shall be calibrated with ~~laboratory and/or field~~ site-specific data.

Figure 5. Typical Well Construction Design

WELL SCREEN (IF USED)
GRAVEL PACK (IF USED)
SAND TRAP (IF USED)
CHECK VALVE (IF USED)

V.E.2. Well Casing Requirements

Injection and production well casing shall:

a. Meet or exceed the specifications of ASTM Standard F480 and NSF Standard 14 for thermoplastic pipe, including PVC;

V.E.3. Injection Piping Requirements

The injection ~~or production~~ pipe shall:

a. meet or exceed the specifications of ASTM Standard D~~2239~~ 3350 ~~and NSF Standard 14~~ for polyethylene pipe,

b. have no greater than SDR 11, and

c. have a pressure rating that exceeds the highest maximum allowable injection pressure for the wellfield.

Table 12. Injection~~/Production~~ Pipe Dimensions for SDR 11

Proposed Injection~~/Production~~ Pipe Diameter (inches)	Minimum Casing Pipe Wall Thickness (inches)
1.0	0.09
1.5	0.136

See comment #31.

V.E.4. Well Cementing Requirements

a. The Permittee shall isolate all USDWs by placing cement/bentonite grout between the outermost casing and the well bore from top of well to top of well screen.

b. The Permittee shall use cement/bentonite grout:

i. Of a quantity and quality to withstand the maximum operating pressure; and

ii. Which is resistant to deterioration from formation and injection fluids; and

iii. In a quantity no less than 120% of the calculated volume necessary to fill the borehole-casing annulus from the top of the injection interval to the ground surface.

c. With the casing in place, a cement/bentonite grout shall be pumped under pressure into the casing allowing the grout to circulate out the bottom of the casing and back up the casing annulus to the ground surface.

V.H. Postponement of Construction

1. If ~~T~~the Permittee ~~shall~~ does not begin construction of at least one of the proposed wellfields within one year of the Effective Date of the Permit, the Permittee shall present an annual Area of Review (AOR) update to EPA until construction commences. The AOR update shall include identifying the location and screened interval of any new domestic wells within 2 kilometers (1.2 miles) of the potential wellfield area, as measured from the perimeter monitoring well ring.

V.I.1. Demonstration that Manifold Monitoring Is Equivalent to Individual Well Monitoring

a. In order for the Permittee to use manifold monitoring rather than individual well monitoring and use the header house pressure gauge as the point of compliance for monitoring injection pressure, the Permittee shall demonstrate that manifold monitoring is comparable to individual well monitoring.

b. The Permittee shall conduct a bounding analysis demonstration for each header house that manifold monitoring is comparable to individual well monitoring using the maximum anticipated carbon dioxide and oxygen injection rates ~~demonstrate that the injection pressure measured at the header house pressure gauge is greater than or equal to the injection pressure measured at the wellhead of each well connected to the header house~~.

c. A demonstration is valid as long as adjustments stay within the range of the bounding analysis ~~until adjustments are made to the carbon dioxide and oxygen feed lines at the header house, which are located in-line after the header house pressure gauge~~.

d. ~~If, after the initial demonstration, any adjustments are made to either of these feed lines, another demonstration shall be performed.~~

~~e.~~ The bounding analysis shall be provided to EPA within the next ~~A record of injection pressures measured at the header houses and at the wellheads shall be provided with the~~ Quarterly Monitoring Report as required under Part IX, Section F.8.

V.I.2. The installation of following additional equipment is required for manifold monitoring:
e. injection manifolds (as shown in Figures 8 and 9) equipped with:
iv. In the Burdock Central Processing Plant~~, and~~ the Dewey Satellite Facility or another representative sampling or measurement location:
A) a sampling port in the injectate trunkline to collect representative samples of the injectate for each wellfield;
B) instrumentation to continuously monitor and measure injectate and production flow rate for the daily recording of the injection and production flow rates for each wellfield; and
C) instrumentation to continuously monitor and measure injectate and production volumes for the monthly recording of the injection and production volumes for each wellfield.

~~**V.I.3. Wellhead and Surface Equipment**~~

VII.B. Requirement to Demonstrate and Maintain Mechanical Integrity
1. The Permittee is required to ensure each injection well and production well maintains mechanical integrity at all times. Injection into a well that lack mechanical integrity is prohibited.
2. Before the Authorization to Commence Injection is issued by the Director for each wellfield, the Permittee shall demonstrate that each wellfield injection and production well installed during development of the Injection Authorization Data Package Report has mechanical integrity according to 40 CFR § 146.8. Prior to commencing operation of each injection and production well, the Permittee shall document that the well has mechanical integrity.

VII.G. Ongoing Demonstration of Mechanical Integrity
1. After initial demonstration of mechanical integrity required in Part VII, Section B.2, the Permittee shall demonstrate internal mechanical integrity of each injection well within five (5) years of the last successful mechanical integrity test even if the well is not active. The procedure and criteria for demonstrating internal mechanical integrity are found in Part VII, Section C.4.
2. Results of mechanical integrity tests shall be submitted to the Director with the next scheduled Quarterly Monitoring Report, unless the mechanical integrity test occurred within 45 days before the due date of the Quarterly Monitoring Report. In that case, the mechanical integrity test results shall be submitted with the following Quarterly Monitoring Report.
3. Failing to provide the EPA with a successful demonstration of mechanical integrity in a timely manner will be a violation of this permit.
~~4. Ongoing Demonstration of Internal Mechanical Integrity~~
~~a. After the initial demonstration of internal mechanical integrity, all injection and production wells shall be field tested to demonstrate ongoing mechanical integrity of the well casing.~~
~~**b. The procedure and criteria for demonstrating internal mechanical integrity are found in Part VII, Section C.4.**~~

VIII.C. Requirements Prior to Commencing Injection in a Wellfield
1. General Requirements
The Permittee shall not commence injection until:
d. Initial demonstration of mechanical integrity pursuant to 40 CFR §1-46.8 and Part VII, Section B.2 has been successful and documented; and

VIII.C.2. Confirmation of Aquifer Baseline Potentiometric Surface

a. After the construction of all wellfield perimeter and non-injection interval monitoring wells and a representative number of injection or production ~~injection, production and monitoring~~ wells is completed and the static potentiometric surface for each aquifer has stabilized from well development activities and the wellfield pump tests, the static potentiometric water levels shall be measured in every well in the monitoring system prior to the initiation of injection into the wellfield to determine the degree to which the injection interval potentiometric surface recovered after the wellfield pump tests.

VIII.E.5. MAIP Compliance Point

a. The Permittee shall use a pressure gauge located either at each wellhead or at the injection manifold at each header house as the compliance point at which the MAIP is demonstrated not to exceed the permit limit set according to Section E.3 of this Part.

b. The Permittee may use pressure gauges at the injection manifold only after verification that the header house pressure gauge is greater than or equal to the injection pressure measured at the wellhead of each injection well connected to the header house as described under Part V, Section I.1-~~the following section~~.

~~c. The Permittee shall conduct an initial injection pressure calibration check to be performed as each header house is brought online. The initial injection pressure calibration check shall involve measuring the injection pressure at each wellhead to verify that it is not greater than the injection pressure measured at the pressure gauge on the header house injection line. If the injection pressure at any injection wellhead is greater than the pressure measured at the header house injection line pressure gauge, the pressure to the individual injection well shall be adjusted so that the injection pressure at the injection wellhead is equal to or less than the injection pressure measured at the header house injection trunkline pressure gauge.~~

V.F.5. Hydraulic Control of Wellfield during Groundwater Restoration

c. The Permittee shall monitor the water levels in the wellfield perimeter monitoring well ring in accordance with the requirements in Part IX, Section B.1.e, Table 14.F~~D~~ and Part IX, Section C.

VIII.H. Injection Fluid Limitation

2. During the groundwater restoration phase, the injectate will be limited to permeate from reverse osmosis (RO) treatment of groundwater extracted from the post-ISR wellfields, ~~or~~ clean makeup water from the Madison Limestone, or groundwater recirculated within the wellfield. Chemical reductant may be injected only after prior written authorization from the Director.

VIII.H. Injection Fluid Limitation

4. If the Permittee elects to pump groundwater from the down-gradient compliance boundary wells and decides to reinject~~ion~~ the pumped groundwater into another location within the exempted portion of the Inyan Kara aquifers, the Permittee shall submit an authorization by rule proposal to the Director.

IX.B. Monitoring Parameters, Frequency, Records and Reports
Monitoring parameters and frequency are specified in Section 1 below.
1. Monitoring Parameters and Frequency
c. The injection and production flow rates shall be continuously monitored for each wellfield and shall be recorded daily from monitoring devices at the Burdock Central Processing Plant, ~~and~~ the Dewey Satellite Facility or another representative location.
d. Monthly injection and production volumes shall be continuously monitored and recorded for each wellfield from monitoring performed at the Burdock Central Processing Plant, ~~and~~ the Dewey Satellite Facility or another representative location.

IX.B.2. Determining Baseline Water Quality for Non-injection Interval Monitoring Wells
The Permittee shall determine baseline water quality ~~permit limits~~ for non-injection interval monitoring wells according to the requirements under Section 11.3 Establishment of Commission-Approved Background Water Quality in the NRC Source Material License.

IX.B.3. Down-gradient Compliance Boundary Baseline Monitoring
Baseline groundwater characterization sampling shall be performed ~~quarterly~~ on Down-gradient Compliance Boundary wells as designated in the approved wellfield Post-Restoration Monitoring Plan beginning after well development through the end of wellfield restoration. At least four pre-operational baseline samples shall be collected at least 14 days apart prior to operation of the wellfield. Samples shall be collected annually from the onset of operations through regulatory approval of groundwater restoration. Groundwater samples shall be collected according to the procedures in Part II, Section E.2.b. The samples shall be analyzed for the baseline water quality parameters listed in Table 8 using the analytical methods shown. Equivalent analytical methods may be used after prior approval by the Director.

Remove Table 14C.
Remove Table 14D.
Remove Table 14F.
Remove the following from Table 14H:
- Samples from operational monitoring stock wells within permit area for chloride, total alkalinity, and specific conductance
- Samples from the operational monitoring wells listed in Table 16 for baseline parameters (Table 8)
Remove Table 14J.
Remove Table 16.
Remove Figures 10-14.

IX.F. Reporting Requirements
10. Submittal of NRC Reports and Documents
a. The Permittee shall submit, for informational purposes only and at the same time as provided to NRC, the following information:
i. All groundwater sampling data.
ii. The semi-annual report required by NRC under License Condition 11.1B, which discusses the status of wellfields in operation. The report includes the progress of wellfields in restoration and restoration progress, status of any long-term excursions, and a summary of MITs conducted during the reporting period.
iii. The groundwater quality data required by NRC under License Condition 11.3. This data includes the background water quality for the ore zone, overlying aquifers, underlying aquifers alluvial aquifer, and perimeter monitoring areas.
iv. Water quality data from the annual samples required by NRC under License Condition 12.10 for each domestic well within 2 km (1.25 miles) of the boundary of each wellfield as measured from the perimeter monitoring well rings.
v. Water quality data from the quarterly samples required by NRC under License Condition 12.10 for each stock well within the permit area.
vi. Water quality data from the quarterly samples required by Section 5.7.8.2 of the approved NRC license application for each operational monitoring well.
vii. Any reports submitted to NRC regarding excursions, including initial reports, follow-up reports, progress reports and quarterly reports required under License Condition 11.1 that include excursion parameter concentrations, wells placed on or removed from excursion status, corrective actions taken, and the results for all wells that were on excursion status during the quarter.

Table 14. Monitoring Parameters and Frequency

A. CONTINUOUSLY	
MONITOR	Injection Pressure (psig) at each header house
	Injection Rate (gpm) for each wellfield at injection trunkline at the Burdock Central Processing , ~~and~~ the Dewey Satellite Facility or another representative location Production rate (gpm) for each wellfield at production trunkline at the Burdock Central Processing Plant, ~~and~~ the Dewey Satellite Facility or another representative location
	Injection volume (gallons) for each wellfield at injection trunkline at the Burdock Central Processing Plant, ~~and~~ the Dewey Satellite Facility or another representative location Production volume (gallons) for each wellfield at production trunkline at the Burdock Central Processing Plant, ~~and~~ the Dewey Satellite Facility or another representative location

Table 14. Monitoring Parameters and Frequency

F. 60 DAY INTERVAL EXCURSION MONITORING DURING GROUNDWATER RESTORATION ~~AND STABILITY MONITORING~~

Table 14. Monitoring Parameters and Frequency

G. 60 DAY INTERVAL POST-RESTORATION GROUNDWATER MONITORING	
OBSERVE AND RECORD	Wellfield perimeter monitoring well water levels (until a down-gradient flow pattern has been reestablished) Wellfield non-injection interval monitoring well water levels (until a down-gradient flow pattern has been reestablished)
~~ANALYZE~~	~~Water samples from each wellfield non-injection interval monitoring well for baseline water quality parameters listed in Table 8.~~
REPORT	Next scheduled Quarterly Report

Table 14. Monitoring Parameters and Frequency

H. QUARTERLY	
ANALYZE	Samples from operational monitoring stock wells within permit area for chloride, total alkalinity, and specific conductance Samples from the operational monitoring wells listed in Table 16 for ~~baseline~~ parameters as specified in the NRC license ~~(Table 8)~~ ~~Samples from down-gradient wellfield perimeter monitoring well ring wells, Non-injection Interval Monitoring wells and Down-gradient Compliance Boundary Determination Wells from well~~
	~~installation through wellfield restoration for baseline water quality parameters (Table 8)~~

Table 14. Monitoring Parameters and Frequency

I. SIX MONTH INTERVAL POST-RESTORATION GROUNDWATER MONITORING	
ANALYZE	Groundwater samples from the Down-gradient Compliance Boundary wells for baseline water quality parameters (Table 8) Water samples from each wellfield non-injection interval monitoring well for chloride, total alkalinity, and specific conductance
REPORT	Include analytical results in next scheduled Quarterly Report after analytical results are received from laboratory.

Table 14. Monitoring Parameters and Frequency

J. ANNUALLY	
ANALYZE	Groundwater samples from the domestic wells within 1.2 miles of the boundary of each wellfield (as measured from the perimeter monitoring well ring) ~~project boundary~~ for ~~baseline~~ water quality parameters as specified in the NRC license ~~(Table 8)~~
REPORT	Include analytical results in next scheduled Quarterly Report after analytical results are received from laboratory.

Table 14. Monitoring Parameters and Frequency

K. 24-HOUR REPORTING	
REPORT	If any ISR contaminant crosses the aquifer exemption boundary in a concentration above the baseline permit limits as described in Part IX, Section E.14. ~~System failures.~~
	System failures.
	Upon discovery of any ~~other~~ noncompliance requiring 24-hour reporting as described in Part XII, Section D.11~~.;~~

IX.B.4. Operational Groundwater Monitoring

a. Domestic Wells

i. During operations, the Permittee shall monitor all down-gradient domestic wells within 1.2 miles of the boundary of each wellfield (as measured from the perimeter monitoring well ring) ~~the Area of Review~~, unless the well owners do not consent to sampling or the condition of the wells renders a well unsuitable for sampling.

ii. Wells to be monitored under this requirement are shown in Figure 10.

iii. Samples shall be collected annually ~~quarterly~~ and analyzed for the ~~baseline~~ water quality parameters as specified in the NRC license ~~listed in Table 8~~.

IX.B.4. Operational Groundwater Monitoring

c. Monitoring Wells

The Permittee shall monitor wells located hydrologically up-gradient and down-gradient of ISR operations as part of the operational groundwater monitoring program.

Monitoring wells included in the operational monitoring program shall include wells completed in the alluvium, Fall River, Chilson, and Unkpapa aquifers.

The proposed wells indicated in Table 16 (Well ID is TBD) and in Figures 12 and 13 shall be installed before the first wellfield pump test is conducted in the Burdock Area.

The monitoring wells shall be monitored quarterly and analyzed for the ~~baseline~~ water quality parameters as specified in the NRC license ~~listed in Table 8~~.

Table 16. Monitoring Wells Included in Operational Monitoring Program

Well ID	Qrt- Qrt
Alluvium	
DC-1	NWSW
DC-2	SESW
DC-3	NWSE
DC-4~~2~~	NWNW

Figure 11. Operational Monitoring Wells - Stock Wells

IX.C. Excursion Monitoring
2. During Groundwater Restoration ~~and Stability Monitoring~~

IX.C. Excursion Monitoring3. During a Confirmed Excursion Event~~c. Monitoring Nearest Unimpacted Wellfield Perimeter Monitoring Wells~~: ~~For injection zone excursions impacting wellfield perimeter monitoring wells, the nearest injection interval wellfield perimeter monitoring wells on each side of the impacted well(s) that have not been impacted by the excursion shall also be monitored weekly according to a and b above to verify that the excursion plume is not expanding.~~

IX.C. Excursion Monitoring

3. During a Confirmed Excursion Event

~~**d. Criteria for Expanding Excursion Plume:** If groundwater samples from any of the nearest unimpacted wellfield perimeter monitoring wells begin to show concentrations of any two excursion indicator parameters exceed their respective Upper Control Limit (UCL), as established under the NRC License, or any one excursion indicator parameter exceeds its UCL by 20 percent, the excursion criterion is exceeded.~~

~~**e. Verification Actions for Expanding Excursion Plume:**~~

~~i. A verification sample shall be taken from the newly impacted well(s) within 48 hours after results of the first analyses are received.~~

~~ii. If the verification sample confirms that the excursion criterion is exceeded, the well shall be placed on excursion status and the excursion is considered to be an expanding plume. The Permittee shall begin additional monitoring of an expanding excursion plume as required under Section 4 below.~~

~~iii. If the verification sample does not confirm that the excursion criterion is exceeded, a third sample shall be taken within 48 hours after the results of the verification sample are received. If the third sample shows that the excursion criterion is exceeded, the well shall be placed on excursion status and the excursion is considered to be an expanding plume.~~

~~iv. If the third sample does not show that the excursion criterion is exceeded, the first sample shall be considered an error. Routine weekly excursion monitoring shall continue but the well is not placed on excursion status and the excursion is not considered to be an expanding excursion plume.~~

IX.C. Excursion Monitoring
3. During a Confirmed Excursion Event
f. For Excursions Detected in Non-Injection Interval Monitoring Wells that Are Not Corrected within 60 Days:

i. ~~Once~~ If an excursion in a non-injection interval monitoring well has not been corrected within 60 days ~~been verified to be on excursion~~, in addition to the monitoring required under 3a and 3b above, the Permittee shall collect a groundwater sampl~~es every seven (7) days~~ from the impacted well(s) and analyze the samples for the baseline parameters in Table 8. A second sample shall be collected after the excursion is corrected and analyzed for the baseline parameters in Table 8.
ii. If the excursion is detected outside of the exempted aquifer and is not corrected within 60 days, ~~T~~the Permittee shall restore ~~a~~the non-injection zone aquifer impacted by an excursion of injection zone fluids back to baseline concentrations determined under Part IX, Section B.2. This shall be determined by
~~iii. Monitoring of baseline constituents shall continue until~~ three (3) consecutive samples ~~show~~ with concentrations of excursion indicators and any elevated baseline constituents ~~are below~~ that do not demonstrate a statistically significant increase above baseline ~~standards~~ concentrations.
iii. If the excursion occurs within the exempted aquifer and is not corrected within 60 days, the Permittee shall conduct an analysis of the potential to impact groundwater quality outside of the exempted aquifer considering site-specific conditions, corrective actions and monitoring results. ~~If the analytical results from four (4) consecutive weekly samples show increasing concentrations of any excursion parameter or baseline constituent, the Permittee shall begin sampling the nearest unimpacted non-injection interval monitoring wells in the impacted aquifer every seven (7) days and analyze the samples for the baseline constituents in Table 8, or~~

~~**iv. If the excursion has not been remediated in 60 days, the Permittee shall begin sampling the nearest unimpacted non-injection interval monitoring wells in the impacted aquifer every seven (7) days and analyze the samples for the baseline constituents in Table 8.**~~
~~**v. If sampling of the nearest unimpacted wells is required under iii or iv and there are no non-injection interval monitoring wells located down-gradient from the impacted well(s), then the Permittee shall install additional monitoring wells down-gradient from the impacted well according to the requirements in Section 4 below.**~~
~~**vi. If the Permittee decides to pump the affected well for purposes of groundwater remediation, pumping shall occur only at a very low pumping rate to be low enough to result in less than one (1) foot of drawdown in the aquifer potentiometric surface at the well being pumped.**~~
~~**vii. If upon pumping the impacted non-injection zone well, the contaminant concentrations begin to increase, the Permittee shall cease pumping immediately. All the wells near the impacted monitoring well, including the impacted monitoring well, shall be tested for mechanical integrity.**~~
~~**viii. Groundwater pumped from the Inyan Kara aquifers may be disposed of in the deep injection wells after treatment to remove radioactive constituents to below radioactive waste permit limits.**~~

IX.C. Excursion Monitoring

~~**4. Additional Monitoring of an Expanding Excursion Plume**~~

IX.C. Excursion Monitoring

~~**4. Additional Monitoring of an Expanding Excursion Plumeii. New Down-gradient Excursion Monitoring Well Monitoring Requirements**~~

~~E) After remediation of the excursion plume, additional down-gradient monitoring wells shall be monitored according to the frequencies in C.1 and C.2 above for specific conductance measured in the field until post-restoration monitoring has been completed.~~

~~F) If specific conductance increases by 20% from the measurements initially measured in the well(s) after excursion remediation, then the Permittee shall collect verification groundwater samples from the impacted well and analyze them for excursion parameters according to procedures under 3e above to determine if a remnant excursion plume has impacted the well(s).~~

~~G) If a remnant excursion plume has impacted the well(s), the Permittee shall immediately begin pumping the impacted well(s) to recover the remnant excursion and notify the Director within 24 hours according to Part XII, Section D.11.e. Although a remnant excursion plume is not a violation of this Area Permit unless it crosses the aquifer exemption boundary, the Permittee shall follow the requirements for the five (5) day follow up written report.~~

~~H) If a remnant excursion plume has impacted the well(s), the Permittee shall monitor the well(s) impacted by the remnant excursion plume by collecting groundwater samples every seven (7) days and analyzing the samples for the baseline constituents in Table 8.~~

~~I) Monitoring of baseline constituents shall continue until three (3) consecutive samples show concentrations of excursion indicators and any elevated baseline constituents are below baseline standards.~~

~~**IX.E. Post-Restoration Groundwater Monitoring Requirements**~~

IX.E. Post-Restoration Groundwater Monitoring Requirements

2. The Permittee shall ~~continue to~~ measure water levels in the wellfield perimeter monitoring wells every 60 days during post-restoration groundwater monitoring until it can be demonstrated that the down-gradient groundwater flow pattern in the injection interval has been reestablished. ~~as required during groundwater restoration and stability monitoring. Groundwater levels in a representative number of wellfield wells shall also be monitored every 60 days to provide information on the injection interval potentiometric surface within the wellfield. The purpose of this monitoring is to demonstrate the return of the natural groundwater gradient in and around the wellfield area. Pre-operational injection interval potentiometric surface elevations do not have to be achieved for this demonstration, but a down-gradient groundwater flow pattern should be reestablished.~~

IX.E. Post-Restoration Groundwater Monitoring Requirements

3. The Permittee shall also ~~continue to~~ measure the water levels in overlying non-injection interval monitoring wells every 60 days until it can be demonstrated that the down-gradient groundwater flow pattern in the injection interval has been reestablished.

IX.E. Post-Restoration Groundwater Monitoring Requirements

4. The Permittee shall also ~~continue to~~ collect groundwater samples every 6 months from overlying and underlying (if applicable) non-injection interval monitoring wells and analyze them for the excursion monitoring parameters. ~~baseline water quality parameters in Table 8 which have baseline concentrations above the non-detect value in the restored injection interval. The non-injection interval analytical results shall meet the baseline standards established under Section B.2 of this Part.~~

IX.E. Post-Restoration Groundwater Monitoring Requirements

13. If the results from the retesting strategy under 11 above show that an SSI has occurred …

a. Within 30 days from confirmation of the SSI, the Permittee shall submit an aquifer remediation plan for the Director's approval showing how aquifer clean-up and monitoring will be conducted and how the Permittee will ensure that no ~~further~~ migration of ISR contaminants will occur across the aquifer exemption boundary and cause a violation of MCLs or otherwise adversely affect human health outside of the exempted aquifer ~~will be accomplished~~.

IX.F.5. Demonstration that Manifold Monitoring of Injection Pressure is Comparable to Wellhead Monitoring

a. Demonstration shall consist of a list of injection pressures measured at each wellfield injection wellhead compared to the injection pressure measured at the pressure gauge at each header house and the time and date each injection pressure measurement was collected.

b. The Permittee shall conduct a bounding analysis demonstration for each header house that manifold monitoring is comparable to individual well monitoring using the maximum anticipated carbon dioxide and oxygen injection rates.~~b~~c. The Permittee shall make an effort to record the measurements at the same time from wellhead pressure gauge and the header house pressure gauge.

~~c~~d. The report shall consist of

i. injection well identification numbers,

ii. injection pressure measured at each wellhead,

iii. time and date of measurement,

iv. header house identification number for the injection well,

v. header house injection pressure measured,

vi. time and date of measurement,

vii. maximum anticipated flow rate of carbon dioxide for the header house and

viii. maximum anticipated flow rates of oxygen for each injection well.

~~d~~e. This information shall be included in the next Quarterly Report after the information is compiled.

~~e~~f. After the initial demonstration for a wellfield, if adjustments are made to the oxygen flow rate or carbon dioxide flow rates outside of the range of the bounding analysis~~, which are located in-line after the header house pressure gauge~~, then a new demonstration is required.

IX.F.9. Excursion Reportinga. Initial Excursion Reporting

i. If an excursion has been confirmed, the Permittee shall notify the EPA within 24 hours per Part XII, Section D.11.e and follow up with a written report within 5 days.

A) ~~the Permittee shall notify the EPA within 24 hours per Part XII, Section D.11.e and follow up with a written report within 5 days~~.Location of excursion,

X.B. Records of Monitoring Data

6. The Permittee shall also ~~will~~ maintain an electronic database containing well completion and mechanical integrity test records for all injection wells and provide it for EPA use upon request.

XI.B. Well Plugging Requirements

1. Prior to abandonment, each Class III injection well shall be plugged with bentonite or cement grout in a manner which prevents the movement of fluids into or between underground sources of drinking water.

XII.D.11. Reporting Requirements

i. Oil Spill and Chemical Release Reporting: The Permittee shall comply with all reporting requirements related to the occurrence of oil spills and chemical releases by contacting the National Response Center ~~(NRC)~~ at (800) 424-8802.

XIII.C. Updated Cost Estimate and Timing for Demonstration of Financial Responsibility

An updated cost estimate shall be submitted at least 90 days prior to initial construction of Class III injection wells within the permit area ~~upon the Issue Date of the Final Permit~~. The demonstration of financial responsibility shall be submitted to the EPA ~~within 21 calendar days of the Effective Date of the Final Permit and~~ at least 90 days before the commencement of operation of any Class III injection well ~~construction activities~~.

VS Note: UIC regulations require that the demonstration of FR be in place before well construction begins.

The Permittee shall ensure that the Down-gradient Compliance Boundary extends far enough so that each end of the boundary intercepts all restored wellfield groundwater flowing down-gradient as illustrated in Figures B2a and B2b. Figure B2a shows the north end of the wellfield in Figure B1; Figure B2b shows the south end of the wellfield in Figure B1. In both figures, the ~~aqua~~ Down-gradient Compliance Boundary extends far enough …

Figure B2b. The Down-gradient Compliance Boundary at the ~~north~~ south end of the wellfield shown in Figure B1 extends far enough at each end to capture any restored groundwater flowing from the wellfield.

Explanation of Alternative(s)

As shown in Table 1 and Figure 2a, two Dewey Area wellfields are planned within Section 33.

Powertech suggests changing the reference to the more general 40 CFR part 147, subpart QQ or else 40 CFR § 147.2101, which pertains to Class III wells.

Class I wells are not proposed by Powertech.

The suggested modification is requested to make it clear that "wellfield" in this context includes the production and injection wells but not the perimeter monitoring wells. This is consistent with the first sentence in this paragraph, which begins "All wellfields <u>and</u> perimeter monitoring wells ..."

Powertech requests updating the description of the mineralized horizons in Dewey Wellfield 2 in Table 3 and Table 1 in the Fact Sheet. This change would make the cross section description consistent with that for B-WF4, 6, 7 and 8.

Powertech requests updating the minimum number of cross sections listed in Table 3 for Burdock Wellfields 6 and 7 to match the Appendix A figures.

Typographical correction.

Powertech requests modification of the permit condition to accommodate phased development of each ISR wellfield, in accordance with standard ISR industry practice and commitments in the permit application.

Powertech requests correction of the legal locations for Hydro ID 693 and DB08-32-11.

Powertech requests correction of the legal locations DRJ 90 and DB08-1-7.

Please refer to **Attachment A-1** for a proposed alternate solution to collecting at least two cores per wellfield while drilling the down-gradient perimeter monitoring well ring or the Down-gradient Compliance Boundary wells. Comment #28 includes recommended alternative language under Part IV, Section D of the draft permit to replace that in Part II, Section D.5.

Powertech requests modification of the permit condition to accommodate phased development of each ISR wellfield, in accordance with standard ISR industry practice and commitments in the permit application.

Powertech requests modification of the permit condition to accommodate phased development of each ISR wellfield, in accordance with standard ISR industry practice and commitments in the permit application.

Powertech requests changing the monitoring well sampling requirements for consistency with standard ISR industry practice and NRC license requirements. Powertech also requests removal of "Down-gradient Compliance Boundary Wells" based on the alternate solution to post-restoration groundwater monitoring provided in **Attachment A-3**.

Powertech requests changing the stabilization parameters and criteria for consistency with standard ISR industry practice and NRC license requirements.

Powertech requests modifying the baseline water quality parameter list for consistency with NRC license requirements.

Powertech requests omitting gross gamma, lead-210, polonium-210, and thorium-230 from the baseline water quality parameter list for consistency with NRC license requirements.

Powertech requests omitting aluminum, antimony, beryllium, strontium, thallium, and thorium from the baseline water quality parameter list.

Powertech requests omitting silica from the baseline water quality parameter list.

Powertech requests modifying the baseline water quality parameter list to specify dissolved rather than total metals.

Powertech requests modifying the baseline water quality parameter list to specify adjusted gross alpha.

Powertech requests modification of Section 5.4 of the Fact Sheet for consistency with the draft permit and permit application. No change is requested to the draft permit condition.

Powertech proposes to conduct geochemical modeling using site-specific data rather than column testing to demonstrate that no ISR contaminants will cause a violation of MCLs or otherwise adversely affect human health outside of the exempted aquifer for Burdock Wellfields 6, 7 and 8. Attachment A-3 provides explanation of the relative advantages of geochemical modeling to column testing.

Powertech requests changing the reference for maximum injection pressure to Part VIII, Section E.1.

Powertech requests that the permit provision be modified for consistency with 40 CFR § 146.4(a).

Powertech requests modification of Figure 4 or additional clarification for consistency with Table 9.

Please refer to Attachment A-3 for a proposed alternate solution to post-restoration groundwater monitoring. In the event that post-restoration monitoring is required, please refer to Attachment A-2 for a proposed alternate solution for locating Down-Gradient Compliance Boundary Monitoring Wells and Attachment A-4 for a proposed alternate solution to establishing initial baseline values and updating baseline values for Down-Gradient Compliance Boundary Monitoring Wells.

Please refer to **Attachment A-5** for a proposed alternate solution to column testing, **Attachment A-3** for a proposed alternate solution to post-restoration groundwater monitoring, and Attachment A-1 for a proposed alternate solution to collecting core samples during wellfield development. Powertech proposes to conduct geochemical modeling using site-specific data rather than column testing to demonstrate that no ISR contaminants will cause a violation of MCLs or otherwise adversely affect human health outside of the exempted aquifer.

[add this instead]

[additional changes]

Powertech suggests renaming Figure 5 to include “typical” in the title and adding “(if used)” to the well screen, gravel pack, sand trap and check valve labels on the figure for consistency with the Class III permit application.

Powertech requests clarification in the draft permit condition that PVC is suitable for use.

Powertech requests removing “production pipe” from regulation under the Class III permit for the reasons provided herein.

Powertech requests changing the ASTM standard and removing the NSF standard for injection pipe requirements on the basis that the incorrect ASTM standard is cited and NSF 14 is applicable to potable water systems.

Powertech requests changing all instances of “cement” to “cement/bentonite grout” for internal consistency and for consistency with commitments in the permit application.

Recognizing that EPA’s primary concern is that additional private drinking water wells could be constructed in the project vicinity prior to operations, Powertech proposes to replace the requirement to commence construction within a specified timeline with a requirement to present an annual Area of Review (AOR) update to EPA until construction commences.

Powertech proposes to conduct a bounding analysis demonstration for each header house that manifold monitoring is comparable to individual well monitoring using the maximum anticipated carbon dioxide and oxygen injection rates. As long as adjustments stay within the range of the bounding analysis, no repeat demonstration would be required. The bounding analysis would be provided to EPA within the next Quarterly Monitoring Report.

The change is requested in order to provide flexibility concerning the measurement and monitoring locations for individual wellfields and for consistency with the NRC license and standard ISR industry practice.

Powertech requests removing Part V, Section I.3 or providing an explanation as to how the two groups of requirements differ.

Powertech requests modifying the permit condition to recognize that Authorization to Commence Injection would be issued on a wellfield basis and not all injection and production wells would be installed prior to requesting Authorization to Commence Injection. See also comment #8.

Powertech requests combining the two sections as shown.

Typographical correction.

Powertech requests modifying the permit condition to recognize that not all injection and production wells would be installed during initial wellfield development. See also comment #8.

Powertech requests removing the redundant monitoring requirements.

Powertech requests correcting the reference from Table 14D to Table 14F, which contains the monitoring requirements during groundwater restoration.

Powertech requests the flexibility to recirculate groundwater during groundwater restoration. Powertech also requests the flexibility to inject a chemical reductant after prior authorization from EPA.

Powertech requests removing this condition based on the justification provided in Attachment A-3. If post-restoration groundwater monitoring is required, Powertech requests the topographical error.

The changes are requested in order to provide flexibility concerning the measurement and monitoring locations for individual wellfields and for consistency with the NRC license and standard ISR industry practice. See also comment #36.

As described in comment #16, Powertech requests modifying Table 8 for consistency with Table 6.1-1 of the approved NRC license application. Further, in accordance with Attachment A-6, Powertech asserts that the excursion corrective actions reviewed and approved by NRC are adequately protective of the non-injection interval monitoring wells without establishing baseline permit limits for these wells.

As described in **Attachment A-3**, Powertech has proposed an alternate solution to post-restoration groundwater monitoring. In the event that that approach is not approved, the proposed revisions are requested as explained in **Attachment A-4**.

Understanding that EPA's primary concern is to be provided with the results of the monitoring performed under NRC license requirements, Powertech requests that EPA remove duplicative monitoring requirements for monitoring required by the NRC license. This includes excursion monitoring (Tables 14C, 14D and 14F), stock and domestic well monitoring (Table 14H) and sampling operational monitoring wells (Table 14H, Table 16 and Figures 10-14). The reporting requirements under Table 14H would require Powertech to provide monitoring results to EPA in the quarterly reports, without the need to specify monitoring locations, frequencies, or parameters in the Class III permit. See also Attachment A-7 for additional justification for the removal of Table 14C.

[add this requirement]

The changes are requested in order to provide flexibility concerning the measurement and monitoring locations for individual wellfields and for consistency with the NRC license and standard ISR industry practice. See also comment #36. Alternately, the location where monitoring would occur could be removed for consistency with Table 14E.

As described in comment #49, Powertech requests removal of Table 14F, since it contains monitoring requirements under NRC regulatory jurisdiction. In the event that the table is not removed, Powertech requests modification of the table title for consistency with NRC license requirements.

Powertech requests removal of Table 14G on the basis of the proposed alternate solution to post-restoration monitoring in Attachment A-3. In the event that post-restoration monitoring is required, Powertech requests modification of the non-injection interval monitoring well water level monitoring requirement to every 6 months for internal consistency within the document. Please see comment #54. Powertech also requests modification of the water level monitoring requirements for internal consistency with the draft permit. Please refer to Attachment A-9 for a proposed alternate solution to monitoring non-injection interval monitoring wells during post-restoration groundwater monitoring.

As described in comment #49, Powertech requests removal of monitoring requirements in Table 14H that are duplicative of NRC monitoring requirements, including those for stock wells and operational monitoring wells. In the event that those modifications are not made, Powertech requests modification of the parameter list for operational monitoring wells for consistency with NRC license requirements.

Powertech also requests removal of the proposed quarterly monitoring requirements for down-gradient perimeter monitoring wells and non-injection interval monitoring wells, since no justification is provided in the draft permit for this monitoring.

Powertech also requests removal of the quarterly monitoring requirements for Down-gradient Compliance Boundary Monitoring Wells, as described in **Attachment A-4**.

As described in Attachment A-3, Powertech requests removal of the post-restoration monitoring requirements in lieu of geochemical modeling using site-specific data. In the event that that request is not approved, Powertech suggests adding the 6-month excursion monitoring in non-injection interval monitoring wells for consistency with Part IX, Section E.4 and for the excursion monitoring parameters, as described in **Attachment A-9**.

As described in comment #49, Powertech requests removal of Table 14J, since it contains monitoring requirements under NRC regulatory jurisdiction. In the event that those modifications are not made, Powertech requests modification of the parameter list for domestic wells for consistency with NRC license requirements.

Powertech also requests modifying the location of the domestic wells included in the operational monitoring program for consistency with NRC license requirements.

Powertech requests clarification in the draft permit on the definition of system failures and verification that alarms or shutdowns not resulting in any violations of permit conditions would not require 24-hour reporting. Powertech also request EPA review of the apparent discrepancy between the reporting requirements for "any other noncompliance."

See also comment #49, which requests removal of additional monitoring requirements that are duplicative of NRC monitoring requirements, including those for domestic wells. In the event that those modifications are not made, Powertech requests modification of the parameter list and location for domestic wells for consistency with NRC license requirements. See also comment #55.

See also comment #49, which requests removal of additional monitoring requirements that are duplicative of NRC monitoring requirements, including those for operational groundwater monitoring wells. In the event that those modifications are not made, Powertech requests modification of the parameter list for operational groundwater monitoring wells for consistency with NRC license requirements. See also comment #53.

As described in comment #49, Powertech requests removal of Table 14F, since it contains monitoring requirements under NRC regulatory jurisdiction. In the event that the table is not removed, Powertech requests modification of the table as shown.

Powertech requests correcting the internal inconsistency regarding whether Well 41 is a stock or domestic well. Figure 3 in the Aquifer Exemption ROD should be corrected to depict Well 41 as a stock well.

Powertech requests removing “and Stability Monitoring” for consistency with NRC license requirements. See also comment #51.

Powertech requests removing additional monitoring requirements for a potential expanding excursion plume based on the justification provided in **Attachment A-7**.

Powertech requests removing additional monitoring requirements for a potential expanding excursion plume based on the justification provided in Attachment A-7.

Powertech requests modifying the additional monitoring and corrective action requirements for an excursion in a non-injection interval monitoring well as described in Attachment A-6.

Powertech requests removing additional monitoring requirements for a potential expanding excursion plume based on the justification provided in **Attachment A-7**.

Powertech requests removing additional monitoring requirements for a potential remnant excursion plume based on the justification provided in **Attachment A-8**.

Powertech requests removing post-restoration monitoring requirements based on the justification provided in **Attachment A-3**.

Please refer to **Attachment A-3** for a proposed alternate solution to post-restoration groundwater monitoring. In the event that post-restoration groundwater monitoring is required, Powertech requests the proposed modifications for consistency with Part IX, Section E.3 requirements.

Please refer to Attachment A-3 for a proposed alternate solution to post-restoration groundwater monitoring. In the event that post-restoration groundwater monitoring is required, Powertech requests the proposed modification for consistency with NRC license requirements.

Please refer to **Attachment A-3** for a proposed alternate solution to post-restoration groundwater monitoring. In the event that post-restoration groundwater monitoring is required, Powertech requests modification of the non-injection interval excursion monitoring requirements during post-restoration monitoring as described in **Attachment A-9**.

Please refer to Attachment A-3 for a proposed alternate solution to post-restoration groundwater monitoring. In the event that post-restoration groundwater monitoring is required, Powertech requests modification to clarify that an SSI within the exempted aquifer does not signal migration of ISR contamination across the aquifer exemption boundary. Powertech also requests clarification of the language for consistency with 40 CFR § 144.12(a).

Powertech requests removal of this condition as duplicative of the requirements in Part V, Section I.1. In the event that this condition remains, Powertech requests modification for consistency with the modifications proposed in comment #35.

Powertech requests removing the duplicative requirements.

Typographical correction.

The proposed modifications are requested for consistency with NRC license and State of South Dakota plugging requirements.

Powertech suggests removing the "NRC" acronym for National Response Center.

Powertech proposes to provide EPA with an updated financial responsibility cost estimate at least 90 days prior to initial construction of Class III injection wells within the permit area. This is consistent with License Condition (LC) 9.5 in NRC license SUA-1600, which requires Powertech to provide an updated financial assurance estimate at least 90 days prior to beginning construction activities associated with any planned expansion or operational change that was not included in an annual financial assurance update. Powertech proposes to provide EPA with demonstration of financial responsibility at least 90 days prior to commencing operations. This is also consistent with LC 9.5, which requires Powertech to submit the financial assurance instrument for NRC staff review and approval 90 days prior to commencing operations.

Typographical correction.

Typographical correction.

Comment

The legal description of the Dewey Area wellfields is incorrect.

Why are South Dakota regulations in 40 CFR § 147.2100 referenced, when those regulations are for Class II wells?

Class I wells should not be depicted on Figures 2a and 2b.

The draft permit condition may be misconstrued as requiring perimeter monitoring wells to be located at least 1,600 feet from the permit area boundary.

Plate 6.21 (Cross Section J-J') in the permit application shows ore in both the Middle and Lower Chilson in D-WF2. This comment also applies to Table 1 in the Fact Sheet, which shows only Middle Chilson for Dewey Wellfield 2.

The minimum number of cross sections listed in Table 3 does not appear to match the cross sections depicted in the Appendix A figures. For B-WF6, a minimum of nine cross sections are specified, but Figure A5 appears to show seven. For B-WF7, the table specifies two, but Figure A5 appears to show only one.

Powertech suggests correcting “ore deposits ore deposits” under B-WF2, B-WF4, B-WF6, B-WF7, B-WF8 and B-WF10.

The current permit condition could be interpreted as requiring the installation of all production and injection wells within each wellfield prior to pump testing. That would be inconsistent with page 8-16 of the permit application, which indicates that the Injection Authorization Data Packages will include a "Commitment to completing MIT and preparing well completion reports for all injection wells prior to initiating injection into the wellfield." It would also be inconsistent with page 70 of the Fact Sheet, which indicates that the Injection Authorization Data Package Reports should contain "Map(s) showing the proposed production and injection well patterns." Similarly, page 56 of the Draft Cumulative Effects Analysis (Section 5.2.1) describes how "As a wellfield expands, Powertech will construct additional header houses connected via buried header piping." It is standard ISR industry practice to install and test the complete monitoring well network for each wellfield and a representative number of injection and production wells that are used for baseline water quality sampling and hydrologic testing. It is not standard ISR industry practice to install all of the injection and production wells prior to beginning operations. These are typically added for each header house at a time, as opposed to installing all of the production and injection wells for the entire wellfield at once.

The location of Hydro ID 693 should be Section 32, as described in Table 17.4 of the permit application and as shown on Figure 14 and listed in Table 16 of the draft permit. Also, the location of DB08-32-11 should be in Section 32, as shown on Plate 6.6 of the permit application.

The location of DRJ 90 should be in the SESE quarter and the location of DB08-1-7 should be in Section 1, as shown on Plate 6.6 of the permit application. Also, there is a typo in "T6S R1E T6S R1E."

Attachment A-1 includes comments regarding the proposed requirement to collect core samples prior to ISR operations.

As described in comment #8, not every injection and production well would be installed during initial wellfield development. This change would also make this permit condition consistent with Table 6, which specifies water level measurement requirements “in all pump test wells” (as opposed to all wells), and page 56 of the Fact Sheet, which indicates that “static potentiometric levels must be measured in every pump test well.”

As described in comment #8, not every injection and production well would be installed during initial wellfield development. This change would also make this permit condition consistent with Table 6, which specifies water level measurement requirements “in all pump test wells” (as opposed to all wells), and page 56 of the Fact Sheet, which indicates that “static potentiometric levels must be measured in every pump test well.”

The proposed requirement to use low-stress/low-flow sampling techniques for collecting water samples from monitoring wells is inconsistent with NRC license requirements. In Section 14.2.2 of the permit application, Powertech committed to establishing baseline water quality in all monitoring wells "according to NRC license requirements." Those requirements are found in Section 5.7.8.2 of the approved NRC license application (**Exhibit 010**) and include measuring the static water level (or shut-in pressure for flowing artesian wells), purging three casing volumes, and measuring field pH, specific conductance and temperature until each field parameter stabilizes within 10%. Typically, monitoring wells will have dedicated submersible pumps, which are not compatible with low-flow sampling techniques. In fact, NRC reviewed a recent licensee's low-flow sampling methodology and determined that it is not appropriate for groundwater protection monitoring during ISR operations (**Exhibit 011**).

As described in the previous comment, the NRC license requires analysis of three field parameters (pH, specific conductance and temperature) during monitor well sampling. The approved NRC license application also specifies a stability criterion of 10% for each of these constituents. For consistency with the NRC license, Powertech suggests changing Table 7 to list these three constituents along with the 10% stabilization criterion for each.

Analysis of oxidation-reduction potential (ORP), turbidity and dissolved oxygen are not included in the NRC license requirements. Powertech requests omitting these constituents from Table 7 for that reason and since these constituents are not common indicator parameters for the relatively deep, bedrock aquifers that will be monitored. For example, the EPA guidance document cited under Part II, Sec. E.2.b.i.A indicates that "Oxidation-reduction potential may not always be an appropriate stabilization parameter." Similarly, Appelo and Postma 2004 (Exhibit 039 at 16) state that "Eh measurements only give a qualitative indication of redox conditions and should be made as sloppy as possible, so you will not be tempted to relate then to anything qualitative afterwards." Similarly, dissolved oxygen measurements, particularly at low levels, are difficult to measure and to interpret. Due to the potential for ambient (atmospheric) contamination, no conclusions can reliably be drawn from dissolved oxygen measurements under typical field conditions. ORP, turbidity and dissolved oxygen are appropriate for surface water or shallow groundwater sampling where the water would be expected to have seasonal variation in turbidity levels and varying dissolved oxygen and ORP concentrations. They are not appropriate for deep bedrock aquifers where oxygen is absent and turbidity is only related to well development and does not affect dissolved constituent concentrations.

There is an inconsistency between the NRC license and draft permit in terms of the parameters sampled during baseline monitoring in the perimeter monitoring wells, wells completed within the injection interval, and non-injection interval monitoring wells. License Condition 11.3 of SUA-1600 (Exhibit 016) requires Powertech to sample these wells for the parameters listed in Table 6.1-1 of the approved NRC license application. Part II, Section E.2.b.iii would require Powertech to have samples from the same wells analyzed for a significantly different set of parameters. Key differences include:

1. Additional radiological parameters in Table 8, including gross gamma, lead-210, polonium-210 and thorium 230.
2. Table 6.1-1 in the approved NRC license application specifies adjusted gross alpha (excluding activity from radon and uranium), but Table 8 does not.
3. Additional metals and trace elements in Table 8, including aluminum, antimony, beryllium, strontium, thallium and thorium.
4. Total metals in Table 8 vs. dissolved metals in Table 6.1-1 of the approved NRC license application.
5. The addition of silica in Table 8.

Since these wells typically would be within the exempted aquifer, Powertech questions the need to significantly expand the list of parameters beyond what was approved by NRC, especially since that list was taken directly from NRC guidance (NUREG-1569, Exhibit 012) and reflects constituents typically affected by ISR operations. The Table 8 comments below provide specific justification for excluding the extra radiological parameters, metals/trace elements and silica from Table 8. Overall, the addition of the extra parameters would slow sample turn-around time and cost millions of dollars extra without providing any added protection for USDWs beyond what is already required by NRC license requirements.

It is appropriate to remove gross gamma, lead-210, polonium-210, and thorium-230 from the list of radiological parameters required for baseline water quality analysis on the following basis:

1. They are not required by NRC license requirements (see Table 6.1-1 of the approved NRC license application, Exhibit 010).
2. They are not listed in NRC guidance for pre-operational baseline groundwater monitoring (see Table 2.7.3-1 and Sections 2.7.3 and 5.7.8.3 in NUREG-1569, Exhibit 012).
3. Thorium-230 is specifically evaluated in NUREG-1569, which determined that "after restoration, thorium in the ground water will not remain in solution because the chemistry of thorium causes it to precipitate and chemically react with the rock matrix."
4. They have the longest turn-around times of all analytes (standard turn-around time is 20 business days, Exhibit 013).
5. They account for most of the added cost of analysis but are unnecessary to monitor according to the federal agency with primary regulatory jurisdiction for uranium ISR projects in South Dakota (NRC).

It is appropriate to remove the following metals and trace elements from the list of baseline water quality parameters: aluminum, antimony, beryllium, strontium, thallium and thorium. These changes are requested on the following basis:
1. They are not required by NRC license requirements (see Table 6.1-1 of the approved NRC license application, Exhibit 010).
2. They are not listed in NRC guidance for pre-operational baseline groundwater monitoring (see Table 2.7.3-1 and Sections 2.7.3 and 5.7.8.3 in NUREG-1569, Exhibit 012).
3. Aluminum, antimony, beryllium and thallium were below detection limits in all Fall River wells and all but one of the Chilson wells sampled during the site characterization baseline sampling (see Appendix N in the permit application).
4. Aluminum was specifically evaluated in NUREG-1569, which determined that "in situ leach operations are not expected to mobilize aluminum."
5. Thorium-232 (natural thorium) was below detection limits in all Fall River wells and all Chilson wells sampled during the site characterization baseline sampling (see Appendix N in the permit application).
6. The State of South Dakota does not have a human health standard for strontium in ARSD 74:54:01 Groundwater Quality Standards. Strontium is not generally associated with uranium deposits.

It is appropriate to remove silica from the list of baseline water quality parameters on the following basis:
1. It is not required by NRC license requirements (see Table 6.1-1 of the approved NRC license application, Exhibit 010).
2. The only basis found within the Fact Sheet indicates that it is "included in case Powertech or the UIC Director decides reactive transport modeling is needed …" Although geochemical modeling may involve analysis of constituents other than those required for baseline characterization, such analysis would typically be limited to the restored aquifer and/or down-gradient wells, which would be the primary focus of the modeling efforts. Powertech could find no basis for requiring analysis of silica in all monitoring wells or for establishing compliance limits for silica based on the baseline sampling results.
3. Even in the context of reactive transport modeling, the benefits of having silica and aluminum data would be slight. The near neutral pH present in typical ISR lixiviants will do little to dissolve silicate minerals.

It is appropriate to analyze the dissolved fraction of metals rather than the total concentration during baseline water quality sampling on the following basis:
1. Dissolved metal analysis is required by NRC license requirements (see Table 6.1-1 of the approved NRC license application, Exhibit 010). Analyzing the same constituents for dissolved concentrations under the NRC license and total concentrations under the EPA permit would lead to confusion regarding establishing UCLs, groundwater restoration targets, etc.
2. The wells for which the baseline monitoring list would apply would be within the exempted aquifer, where NRC has primary regulatory authority for excursion monitoring, groundwater restoration, etc. Therefore, it is appropriate to use the NRC-approved constituent list.
3. Analytical results representing the soluble (mobile) metals are more appropriate than suspended (particulate) metals.
4. Dissolved analyses generally are preferred for most RCRA, CERCLA, and SDWA programs and consistent with permit requirements for UIC wells in other EPA regions and states.
5. MCLs for inorganic constituents in 40 CFR part 141 generally apply to the dissolved fraction of the constituent.
6. South Dakota human health standards for inorganic constituents except for mercury apply to the dissolved portion (ARSD 74:54:01:04).

It is appropriate to analyze for adjusted gross alpha (excluding activity from radon and uranium) in the baseline samples on the following basis:
1. Table 6.1-1 in the approved NRC license application specifies adjusted gross alpha.
2. The gross alpha MCL in 40 CFR § 141.66 is for adjusted gross alpha (excluding radon and uranium).

Section 5.4 of the Fact Sheet states that "The pump test duration must be sufficient to create a suitable response in the injection interval perimeter monitoring well ring, a minimum drawdown of 1 foot." This is not specified in the draft permit provision, which states that that the wellfield pump tests should be conducted "as necessary to create drawdown in each injection interval perimeter monitoring well." It is also not consistent with the application, which indicates that the minimum drawdown would "typically" be 1 foot but does not commit to creating 1 foot of drawdown in every perimeter monitoring well. There may be instances where a pumping test produces a clear response in a perimeter monitoring well, but due to distance from the pumping well or other considerations the response is not more than 1 foot.

Please refer to **Attachment A-5** for a proposed alternate solution to column testing and **Attachment A-3** for explanation of geochemical modeling proposed in place of laboratory bench-scale testing to demonstrate that contaminants will not cross the down-gradient aquifer exemption boundary and cause a violation of any primary MCLs or otherwise adversely affect the health of persons.

In addition to the justification provided in Attachment A-3, Powertech asserts that geochemical modeling should be used rather than column testing or other laboratory-scale bench testing to evaluate the potential impact of the partially oxidized groundwater down-gradient from Burdock Wellfields 6, 7 and 8 for the following reasons:
1. EPA appears to be focused exclusively on the attenuation capacity down-gradient of the wellfield, whereas the key for successful groundwater restoration is to demonstrate the aquifer's capacity to maintain stability within the wellfield to prevent uranium and other constituents from remobilizing. As described in Attachment A-3, EPA has concluded that geochemical modeling can be used to provide a "defensible demonstration" that these criteria are met. Powertech is not aware of column testing being used on any ISR projects to make this demonstration.

2. Unlike column testing, geochemical modeling has the ability to evaluate how much oxygen will remain in the wellfield following groundwater restoration. As described on p. 197 of the Dewey-Burdock Safety Evaluation Report (SER, Exhibit 014 at 197):
In assessing the potential for groundwater restoration, the staff reviewed a geochemical modeling report on the Dewey-Burdock site prepared by the USGS, under contract by the USEPA (Johnson, R. H., 2011). In its published work to date, USGS determined that the amount of oxygen remaining in the aquifer (production zone) after restoration is a key factor in stability. If some oxygen remains in the production zone, "some uranium is found in the groundwater." If no dissolved oxygen remains then "uranium is not found in solution."

3. Unlike column testing, geochemical modeling has the ability to evaluate the potential impact of reductant addition during groundwater restoration. Although Powertech's NRC license does not currently authorize reductant addition, the license could be amended if needed to permit injection of sodium sulfide or another suitable reductant to deplete any oxygen remaining after groundwater restoration.
4. Unlike column testing, geochemical modeling based on site-specific data has the ability to assess how much reducing or attenuation capacity remains down-gradient from these wellfields. The fact that the uranium roll fronts have not migrated further down-gradient indicates that reducing capacity still exists.

Part V, Section F is referenced for the equation for the maximum injection pressure; however, that section contains the fracture pressure equation but not the maximum injection pressure equation.

Powertech disagrees with EPA's conclusion that Well 16 must be plugged and abandoned in order to demonstrate that it is not a drinking water well. Apparently, EPA's conclusion is based on the fact that this well is considered a domestic well and the State of South Dakota does not differentiate between stock water and drinking water uses for domestic wells. There are several problems with this line of reasoning:

1. EPA is overreaching its regulatory authority by declaring that the only way to determine that Well 16 does not currently serve as a source of drinking water, as required by 40 CFR § 146.4(a), is by plugging the well. Proof that the well does not currently serve as a source of drinking water includes the following (**Exhibit 032 at 5**):

a. The landowner has signed an agreement that the well cannot be used for drinking water.

b. The well is disconnected from any plumbing that would allow it to be used in a residence or otherwise as a drinking water source.

c. The well is controlled by lease agreements that give Powertech clear control over the use of the well.

d. The well is not accessible by the public. The wellhead is contained within an underground vault.

e. Powertech has already provided a replacement source of drinking water for the residence (delivered water).

2. Powertech committed in its Class III permit application and approved NRC license application to provide a replacement water source for any well removed from private use. Powertech is bound by this commitment to provide an alternate drinking water source for the residence formerly served by Well 16 for the duration of the project, which surpasses the regulatory requirement of demonstrating that the well does not currently serve as a drinking water source.

3. Table 17.8 in the Class III permit application demonstrates that Well 16 is unfit for human consumption on the basis that it exceeds MCLs for gross alpha and radium-226.

Table 9 specifies that the Lower Fall River step rate test should be on the perimeter monitoring well ring for Dewey Wellfield 1 but outside of the perimeter monitoring well ring for Dewey Wellfields 2 and 4. Table 9 similarly specifies that the Lower or Middle Chilson test should be on the perimeter monitoring well ring for Dewey Wellfield 2 but outside of the perimeter monitoring well ring for Dewey Wellfields 1 and 4. In contrast, Figure 4 shows two possible test locations that both coincide with two different perimeter monitoring rings (1a coincides with Dewey Wellfields 1, 2 and 4, and 1b coincides with Dewey Wellfields 1 and 2).

Attachment A-3 includes comments regarding the proposed post-restoration groundwater monitoring requirements.

Attachment A-5 includes comments regarding proposed column testing requirements.

Powertech is concerned that the well construction standards depicted in Figure 5 may be construed as requiring a well screen and gravel pack for all injection, production, and monitoring wells. This is inconsistent with Section 11.2 of the permit application, which specifies that the well screen assembly and filter sand may or may not be used. It is also inconsistent with Section 7.3 of the Fact Sheet, which indicates that "The use of filter pack is optional." Figure 11.1 of the permit application depicted the "typical" well construction design, whereas Figure 5 in the draft permit is labeled "Well Construction Design." Adding "typical" to the figure title would make it consistent with the title blocks in Figures 6 and 7 in the draft permit.

Figures 6 and 7 show PVC well casing, but "thermoplastic" is the only description in the permit condition.

It is not appropriate to regulate “production pipe” under the Class III permit for the following reasons:

1. Production pipe is defined on page 82 of the Fact Sheet as the pipe within the well casing. For production wells, this pipe is used to convey lixiviant from the well pump to the surface and is not associated with injection. If a leak were to develop in this pipe, it would be contained within the well casing such that no fluids would escape from the well.
2. Although production wells may be converted to injection wells, conversion would involve removing the submersible pump and production pipe and installing injection tubing. Therefore, production pipe would never be associated with an injection well.
3. As shown in Figure 7, the downhole production pipe would typically be 2-inch diameter, which is not listed in Table 12. Therefore, Table 12 does not appear to consider the production pipe specified by Powertech (i.e., Figure 7 in the draft permit, which was taken from the permit application, shows 2-inch downhole pipe in production wells).

The ASTM standard should be modified and the NSF standard removed for the following reasons:

1. ASTM D2239 is for controlled inside diameter (SIDR) pipe, whereas Powertech indicated that SDR pipe would be used (Table 12 also lists “SDR 11” in the title).
2. ASTM D2239 excludes commonly used polyethylene compounds including PE3406 and PE3408. If an ASTM standard must be specified, Powertech suggests using ASTM D3350.
3. NSF 14 includes requirements to protect public health (generally) and potable water systems (specifically). As long as the injection piping meets the dimension and pressure rating requirements listed under Part V, Sections E.3.b and E.3.c, there should not be a requirement to consider the potential human health impacts from the piping material, since there would be no nexus for human consumption.
4. The sole purpose of injection tubing in the Class III injection wells is to allow for the introduction of lixiviant and oxygen into the well casing at the deepest location possible below the static level of fluid in the well casing. As oxygen solubility increases with depth in water, this is only to insure maximum dissolution of oxygen.
5. There is little or no pressure differential between the inside and outside of injection tubing, since it merely hangs within the water in the injection well, which either partially or fully fills the well casing with the injected fluid.

Part V, Sections E.4.a and E.4.b discuss the use of cement to seal the casing annulus, while Section E.4.c discusses use of cement/bentonite grout. It would be more appropriate to use "cement/bentonite grout" for internal consistency and for consistency with the permit application, which specifies that "Cement grout could contain adequate bentonite to maintain the cement in suspension in accordance with Halliburton cement tables." This change would also be consistent with Section 7.3 of the Fact Sheet, which specifies that "Powertech must install cement/bentonite grout ..."

The proposed requirements do not seem to consider that there are a number of permits and regulatory approvals needed prior to construction, including State of South Dakota hearings and additional Section 106 NHPA consultation required under the NRC license. Additionally, economic factors outside of Powertech's control may contribute to a delay in the onset of construction.

Part V, Section I.1 of the Draft Class III Area Permit would require Powertech repeat the demonstration that manifold monitoring is comparable to individual well monitoring after any adjustments to the carbon dioxide or oxygen feed lines at the header house. Since minor adjustments in the gas flow rates may be made routinely, this would require significant time and expense to retest the pressure at each well after minor adjustments. Further, Powertech does not anticipate a significant impact on the injection pressure based on the gaseous flow rates, since the gases would be dissolved in the lixiviant.

The draft permit condition would require “a sampling port in the injectate trunkline to collect representative samples of the injectate for each wellfield” within the Burdock Central Processing Plant and the Dewey Satellite Facility. Similarly, it could be construed to require the ability to measure the injectate and production flow rate “for each wellfield” within the processing facilities. This is inconsistent with the approved NRC license application, which indicates that “main trunklines” will connect the CPP and Satellite Facility to the wellfields (generally to groups of wellfields within the Dewey or Burdock area). Part V, Section J.2.a similarly describes “main trunk lines connecting the [processing facilities] to the wellfields.”

Part V, Section I.3 appears to contain redundant requirements pertaining to equipment required for monitoring within each header house and processing facility with those in Part V, Section I.2.

See also comment #8. The statement is made that the Authorization to Commence Injection “is issued by the Director for each well.” This appears to be inconsistent with Part VIII, Section C, which indicates that Authorization to Commence Injection will be issued on a wellfield basis rather than an individual well basis. Similarly, Part IX, Section F.3 describes how written Authorization to Commence Injection will be issued on a wellfield basis. As described in comment #8, not every injection and production well would be installed during initial wellfield development.

Part VII, Sections G.1 and G.4 appear to contain redundant requirements for ongoing demonstration of internal mechanical integrity.

Powertech requests removing the space in “40 CFR §1 46.8.”

This condition appears to require construction of "all" injection and production wells within a wellfield prior to commencing injection in the wellfield. As described in comment #8, not every injection and production well would be installed during initial wellfield development.

Part VIII, Sec. E.5.c appears to contain redundant requirements for demonstrating that manifold monitoring is comparable to individual wellhead monitoring with those in Part V, Section I.1.

Reference is made to Table 14D, but that contains monitoring requirements during ISR operations rather than groundwater restoration.

Recirculation is commonly used during groundwater restoration to homogenize the groundwater within the restored aquifer. As described in NUREG-1569 (Exhibit 012), "Ground-water recirculation is used to evenly distribute water throughout the restored well field, to dilute any pockets of remaining contamination." It does not appear that the draft permit conditions would authorize injection of recirculation water during groundwater restoration. In addition, chemical reductants such as hydrogen sulfide, sodium sulfide or sodium bisulfide are commonly used to restore reducing conditions and immobilize metals (**Exhibit 012**).

Powertech requests changing "decides to reinjection" to "decides to reinject."

Powertech is concerned that these provisions may be construed as requiring measurement of injection and production flow rates and monthly flow volumes within the CPP and Satellite Facility for each wellfield.

License Condition 11.3 of SUA-1600 requires analyzing baseline samples for the parameters listed in Table 6.1-1 of the approved NRC license application. This appears to create an inconsistency, where baseline would be established for non-injection interval monitoring wells according to one set of parameters, but sampling for the parameters listed in Table 8 of the draft permit would be required to demonstrate remediation of a monitoring well impacted by an excursion (Part IX, Section C.3.f). It would also create an inconsistency within the draft permit, since Part II, Section E.2.b.iii would require analyzing baseline samples from non-injection interval monitoring wells for Table 8 parameters.

With regard to establishing baseline "permit limits" for non-injection interval monitoring wells, please refer to Attachment A-6. Other than alluvial monitoring wells, all non-injection interval monitoring wells would be completed within the exempted aquifer (i.e., within sub-units of the Fall River or Chilson aquifer). Requiring restoration to baseline within the exempted aquifer is inconsistent with what is required for the production zone and is not necessary to prevent contamination outside of the exempted aquifer, since Powertech would be required to cease injection or post additional financial assurance for remediation of the excursion in the event that an excursion is not corrected within 60 days.

Attachment A-4 includes comments regarding establishing initial baseline values and updating baseline values for post-restoration monitoring wells.

The draft permit contains many duplicative monitoring requirements with those required by NRC. This includes excursion monitoring (Tables 14C, 14D and 14F), stock and domestic well monitoring (Table 14H) and sampling operational monitoring wells (Table 14H, Table 16 and Figures 10-14). Explicitly calling out each monitoring well, sampling frequency, etc. in the Class III permit would require modifying the permit in the event that a monitoring location is changed or added. This would be unduly burdensome for monitoring performed under NRC's jurisdiction. Powertech would be willing to submit to EPA any groundwater monitoring results and applicable changes in the NRC license monitoring requirements. Powertech requests adding a new Section 10 under the Part IX, Section F reporting requirements as shown.

Powertech is concerned that these provisions may be construed as requiring measurement of injection and production flow rates and monthly flow volumes within the CPP and Satellite Facility for each wellfield.

The proposed requirement to conduct excursion monitoring during the stability monitoring period is inconsistent with NRC license requirements. Section 6.1.8.1 of the approved NRC license application indicates that excursion monitoring will occur during active restoration, which does not include the stability monitoring period. Since the groundwater would have been restored and no injection would occur into the wellfield during stability monitoring, there is no nexus for an excursion to occur. The current language is also inconsistent with Section 9.2 (page 93) of the Fact Sheet, which indicates that "Groundwater level measurements must be recorded ... every 60 days during groundwater restoration" (with no mention of stability monitoring).

The table indicates that water levels should be measured in non-injection interval monitoring wells every 60 days during post-restoration monitoring. This is inconsistent with Part IX, Section E.3, which indicates that this monitoring can end when it is demonstrated that the down-gradient flow pattern has been reestablished. Similarly, Part IX, Section E.2 implies that perimeter monitoring well water level measurement can be stopped when the down-gradient flow pattern is reestablished.

The table also indicates that during post-restoration monitoring, water samples should be collected from each non-injection interval monitoring well every 60 days. This does not appear to be consistent with Part IX, Section E.4, which specifies a 6-month sampling frequency for non-injection interval monitoring wells during post-restoration monitoring. No mention could be found in the Fact Sheet for an explanation of either the 60-day or 6-month sampling interval for non-injection interval monitoring wells.

The table specifies that samples from operational monitoring wells (i.e., permit-area wide monitoring wells not specific to an ISR wellfield) must be analyzed for the Table 8 list of baseline parameters. As described in comment #16, the Table 8 list of parameters is inconsistent with NRC license requirements, specifically with Table 6.1-1 of the approved NRC license application. The operational monitoring well locations and parameters were approved by NRC and determined to be in conformance with NRC guidance, including NUREG-1569 (Exhibit 012) and NRC Regulatory Guide 4.14 (Exhibit 015). EPA has not stated any justification for adding significantly to the parameter list and cost of analysis for these operational monitoring wells.

No mention could be found in Part IX, Section C for the proposed requirement to sample down-gradient wellfield perimeter monitoring well ring wells and non-injection interval monitoring wells quarterly for the full suite of Table 8 parameters.

Part IX, Section E.4 specifies a 6-month sampling frequency for non-injection interval monitoring wells during post-restoration monitoring, but this provision was not included in Table 14I. See also Attachment A-9 for comments regarding excursion monitoring in non-injection interval monitoring wells during post-restoration monitoring.

The location of domestic wells included in the operational monitoring program is inconsistent within the draft permit and between the draft permit and NRC license. Part IX, Section B.4.a.i specifies that “down-gradient domestic wells within the Area of Review” should be sampled, while Table 14J specifies that “domestic wells within 1.2 miles of the project boundary” should be sampled. These internally inconsistent requirements also do not match Section 5.7.8.2 of the approved NRC license application, which indicates that all domestic wells “within 2 km of the boundary of each well field (as measured from the perimeter monitoring well ring)” should be sampled (Exhibit 010). The same language is included in SUA-1600 License Condition 12.10 (Exhibit 016). NRC’s explanation for the 2-km sampling requirement is provided in the Dewey-Burdock Project SER (Exhibit 014 at pp. 61-62):

The radius of 2 km (1.2 miles) from each proposed ISR wellfield has been shown to be sufficient based on historical and current monitoring data from NRC licensed sites. There are no reported instances of contamination of any monitored private wells within or beyond 2 km of an ISR wellfield at any sites historically or currently licensed by the NRC …

Also, the domestic well operational monitoring requirements indicate that samples from domestic wells must be analyzed for the Table 8 list of baseline parameters. As described in comment #16, the Table 8 list of parameters is inconsistent with NRC license requirements, specifically with Table 6.1-1 of the approved NRC license application. EPA has not stated any justification for adding significantly to the parameter list and cost of analysis for these domestic wells.

System failures should not be included within the same category as an ISR contaminant crossing the aquifer exemption boundary. Moreover, “system failures” are not defined in the draft Class III permit. Powertech requests clarification of which “system failures” would require 24-hour reporting. Regarding the automated control and data recording systems described in Section 13 of the Class III permit application, the automatic controls are designed to provide alarms and, in some cases, automatic shutdown controls in the event that pressures or flows fluctuate outside of normal operating ranges. Such shutdowns are initiated to avoid exceeding any permit conditions. An alarm or shutdown in itself does not indicate a system failure or exceedance of a permit condition, since it would be based on set points below the permit thresholds. As such, Powertech requests that alarms or automatic shutdowns not resulting in any violations of permit conditions not require 24-hour reporting.

Also, the table indicates that 24-hour reporting is required “Upon discovery of any other noncompliance as described in Part XII, Section D.11.j.” However, that section indicates other noncompliance instances are to be reported at the time that monitoring reports are submitted.

See comment #55, which describes how the locations and parameters for operational domestic well monitoring are inconsistent with NRC license requirements. In addition, quarterly sampling is inconsistent with the NRC license and with other draft permit conditions. Section 5.7.8.2 of the approved NRC license application includes Powertech’s commitment to sample nearby domestic wells annually. Annual domestic well sampling is also consistent with Table 14J.

See comment #53, which describes how the parameters for operational groundwater monitoring wells are inconsistent with NRC license requirements.

DC-2 is listed twice in Table 16, and DC-4 is missing from the table.

The figure depicts Well 41 as a stock well, but Figure 3 in the draft Aquifer Exemption ROD depicts it as a domestic well. Section 4.2.1 of the Fact Sheet (page 30) describes how this is now a stock watering well located at an uninhabitable residence. This residence has not been inhabited since before Powertech has worked on the property and is believed to have been uninhabited for at least 30 years or more. It is currently in a state of disrepair which would not allow use of the residence.

See comment #51, which describes how the approved NRC license application requires excursion monitoring during active restoration but not stability monitoring.

Refer to **Attachment A-7**, which includes comments related to the proposed monitoring requirements and corrective actions for an "expanding excursion plume." Specifically, comment A-7-10 describes how standard excursion monitoring procedures include sampling all perimeter monitoring wells every 2 weeks, which will allow Powertech to make a timely determination whether an expanding excursion plume exists.

Refer to Attachment A-7, which includes comments related to the proposed monitoring requirements and corrective actions for an “expanding excursion plume.” Specifically, comment A-7-10 describes how standard excursion monitoring procedures include sampling “expanding excursion plume.” The excursion monitoring and corrective action program reviewed and approved by NRC is a proven method of detecting excursions and will provide timely detection and correction of a potential expanding excursion plume, without the need for additional monitoring requirements or corrective actions.

Refer to Attachment A-6, which includes comments related to the proposed monitoring requirements and corrective actions for an excursion in a non-injection interval monitoring well. The excursion monitoring and corrective action program reviewed and approved by NRC is a proven method of detecting and correcting excursions and will provide timely correction of an excursion in a non-injection interval monitoring well.

Refer to **Attachment A-7**, which includes comments related to the proposed monitoring requirements and corrective actions for an "expanding excursion plume." The excursion monitoring and corrective action program reviewed and approved by NRC is a proven method of detecting excursions and will provide timely detection and correction of a potential expanding excursion plume, without the need for additional monitoring requirements or corrective actions.

Refer to **Attachment A-8**, which includes comments related to the proposed monitoring requirements for a "remnant excursion plume." The excursion monitoring and corrective action program reviewed and approved by NRC is a proven method of detecting excursions and will provide timely detection and correction of a potential remnant excursion plume, without the need for additional monitoring requirements or corrective actions.

Attachment A-3 includes comments regarding the proposed post-restoration monitoring requirements.

See comment #51, which describes how the approved NRC license application requires excursion monitoring, including measuring water levels, during active restoration but not stability monitoring. Further, the draft permit does not specify when Powertech would be able to terminate water level measurement in the perimeter monitoring wells.

Since NRC license requirements do not require excursion monitoring during the stability monitoring period, when no injection or withdrawals would occur within the wellfield, it is incorrect to say that the Permittee will "continue to" measure the water levels.

Attachment A-9 includes comments regarding the proposed non-injection interval excursion monitoring requirements during post-restoration monitoring.

The use of "further" in this proposed condition is incorrect, since this condition will be triggered by an SSI within the exempted aquifer.

The requirements in Part IX, Section F.5 appear to be duplicative of those in Part V, Section I.1. See also comment #35.

It appears that duplicate requirements are listed under Part IX, Sections F.9.a.i and F.9.a.i.A.

Powertech suggests correcting “shall also will.”

Requiring all injection wells to be plugged with cement is internally inconsistent within the draft permit and inconsistent with NRC license requirements and State of South Dakota plugging requirements. Section 6.1.9 of the approved NRC license application specifies that wells will be plugged with bentonite or cement grout to meet the South Dakota well abandonment standards.

The “NRC” acronym is used elsewhere in the draft permit for U.S. Nuclear Regulatory Commission.

The proposed provision would require an updated financial responsibility cost estimate to be submitted upon issuance of the Final Permit and a demonstration of financial responsibility within 21 calendar days of the Effective Date of the Final Permit. As described in comment #34, there are a number of permits and regulatory approvals needed prior to construction, and economic factors may contribute to a delay in the onset of construction.

Powertech suggests removing “aqua” in “the aqua Down-gradient …”

The figure shows the south end of the wellfield rather than the north end.

EPA Notes/Response

Ex. 6 Personal Privacy (PP) also had a comment (#3) about low-flow sampling

Ex. 5 Deliberative Process (DP)

Ex. 5 Deliberative Process (DP)

Table 2. Draft Class III Fact Sheet Specific Comments

No.	Page	Section	Type
F1	Various	Various	C
F2	9	2.0 Table 1	C
F3	60	5.4	C
F4	69	5.6.2	T
F5	82	7.5 Figure 25	C
F6	84	7.6.1	T
F7	93	9.2	C

F8	94	9.3	C
F9	100	11	E, T
F10			

t Specific Comments

Comment and Requested Modification

Comment type key: A – alternate approach proposed; C – correct to be consistent with applicatio

Powertech requests that EPA update the fact sheet consistent with changes made in the draft permit to address the comments in Table 1 and Attachment A. Specific comments related to the draft fact sheet are provided below.

Refer to comment #5 in Table 1. Powertech requests updating the description of the mineralized horizons in Dewey Wellfield 2 in Section 2.0, Table 1. This change would make the cross section description consistent with that for B-WF4, 6, 7 and 8.

Refer to comment #22 in Table 1. Powertech requests modification of the following statement: "The pump test duration must be sufficient to create a suitable response in the injection interval perimeter monitoring well ring~~, a minimum drawdown of 1 foot.~~"

In the 3rd bullet on this page, Powertech requests correcting a typographical error as follows: "the model incorporates the effects of concurrent production and restoration activities in other Burdock wellfields on the Chilson aquifer potentiometric surface in the areas ~~were~~ where partially saturated injection intervals are anticipated."

Powertech requests removing or correcting Figure 25, which appears to show that 1.5-inch polyethylene pipe would have a water pressure rating no higher than about 100 to 150 psi. The figures shown are for Schedule 40 and 80 pipe, which is not consistent with the permit application. The Class III permit application (p. 10-5) indicates that SDR 11 polyethylene pipe with a pressure rating at least 150 psig will be used between the header houses and the wells. Figure 25 is also not consistent with Part V, Section E.3.b of the draft permit, which specifies no greater than SDR 11 polyethylene pipe must be used for injection piping. Depending on the piping material, SDR 11 HDPE has a pressure rating of 160 psi for PE3408 or PE3608 or 200 psi for PE 3710 or PE4710 (Plastic Pipe Institute 2008; **Exhibit 031**).

Moreover, the fact sheet appears to misunderstand Powertech's commitment to maintain the injection pressure below the pressure rating of the pipe between the header house and wellheads. Powertech's commitment applied to the piping between the header house and the wellheads, while EPA's evaluation appears to focus on the injection tubing inside the wells. As described in comment #32 in Table 1, injection tubing is not subject to a significant pressure differential, and a failure in an injection tubing would not release any fluids outside of the well casing.

In the paragraph above Section 7.6.2, Powertech requests correcting a typographical error as follows: "Section 43 also requires ~~Dewey-Burdock Project 11-4 July 2012~~ thermoplastic pipe to conform to ASTM F480."

The statement is made that "During groundwater restoration, the expected bleed rate will be 1.0% of groundwater removal rate in each wellfield." This does not account for the optional groundwater sweep described in Section 10.8.2.1.3 of the Class III permit application. Powertech requests changing this statement as follows: "During groundwater restoration, the expected bleed rate will be 1.0% to 17% of groundwater removal rate in each wellfield."

The statement is made that "At a minimum, one wellfield in the Burdock Area and one wellfield in the Dewey Area will be in the uranium recovery phase at the same time." This is inconsistent with Section 10.10 (p. 10-13) of the Class III permit application, which states that Powertech may develop either the Burdock or Dewey area wellfields first, followed by those in the other area. Powertech's current plans include developing Burdock area wellfields prior to those in the Dewey area (**Exhibit 026**).

Powertech questions the reference to 40 CFR § 146.11(a)(4), since § 146.11 contains criteria and standards applicable to Class I nonhazardous wells and since there is no section (a)(4) under § 146.11.

Comment type key:
A – alternate approach proposed;
C – correct to be consistent with application, regulations or NRC license requirements;
E – additional explanation requested;
I – inconsistency (internally inconsistent between parts of Draft permit or supporting documents);
R – remove; inconsistent with application, regulations or NRC license requirements;
T – typographical error

Table 3. Draft Aquifer Exemption Record of Decision Specific Comments

No.	Draft AE ROD		Fact Sheet		Type
	Page	Section	Page	Section	
E1	3	Background			C
E2	3-5	Description of Proposed AE			E
E3	4	Areal Extent of the AE			T
E4	5	Regulatory Criteria for AE Request			T
E5	7-10	Private Drinking Water Wells inside the AE Boundary	97-99	10.2	C
E6	8 12-15	Fig. 3 Flow Rates Used in the Capture Zone Equation	30	4.2.1	C
E7	15	40 CFR § 146.4(b)(1)			C
E8	20-21	Vertical confinement	22	3.4.2	I

E9	24	Monitoring Requirements	99	11.0	C
E10	25	Monitoring Requirements	104	12.4.2	C
E11	25	Monitoring Requirements	123	12.10	I
E12	25	Other Considerations			C

omments

Comment and Requested Modification

The estimate of 4,000 Class III injection wells is not consistent with Powertech's current estimate. The April 2015 Preliminary Economic Assessment for the Dewey-Burdock Project estimates 1,461 injection wells and 869 production wells for the entire project (TREC 2015; Exhibit 026). Powertech suggests clarifying the current estimate of injection and production wells to help the public understand the total number of each. Powertech's previous estimate of 4,000 total injection/production wells was based on an assumption of a much closer spacing between injection and production wells than what is currently planned. The estimate was based on a 2010 Preliminary Economic Assessment that used a 70-foot by 70-foot dimension for each wellfield pattern, which is roughly half of the average area used in the updated economic assessment.

Please refer to **Attachment A-10** for specific comments regarding the proposed aquifer exemption boundary and a proposed alternate solution. Powertech requests additional explanation as to whether the aquifer exemption area is the green-dashed boundary shown in Figure 2 or 120 feet from the perimeter monitoring well rings around the future wellfields. **Comment A-10-4** in **Attachment A-10** provides specific comments regarding the risk that one or more modifications to the aquifer exemption boundary will be needed during wellfield design and construction, since the green-dashed boundary is based on the approximate perimeter monitoring well ring locations, which are subject to change during delineation drilling.

Powertech requests correcting a typographical error as follows: "The areal extent of the proposed AE is approximately 2,260 acres and includes the areas shown in Figure 2~~1~~."

Uranium Project, South Dakota" September 12, 2011~~2012~~, included as Appendix M of the Class III Permit Application.

Refer to comment #25 in Table 1, which describes how Powertech disagrees with EPA's conclusion that Well 16 must be plugged and abandoned in order to demonstrate that it is not a drinking water well. Powertech disagrees with the identification of Well 41 as a drinking water well (e.g., in Figure 3 and Table 3). As described in comment #60 in Table 1, Well 41 is a stock watering well at an uninhabitable residence that has not been inhabited for 30 years or more. Powertech requests removing this well from the capture zone analysis and Figure 3 in the draft Aquifer Exemption ROD.

Powertech requests updating the reference on the commercial producibility of uranium to the most recent (2015) preliminary economic assessment for the Dewey-Burdock Project (**Exhibit 026**).

Powertech requests clarifying the statement at the bottom of the page that "there is a hydraulic connection between the Fall River Formation and the Chilson Sandstone that would call into question the integrity of the Fuson Shale as an upper confining zone to the Chilson Sandstone". Specifically, Powertech requests clarifying that this statement only applies to an isolated area. As currently written, the statement could be construed as indicating a general hydraulic connection across the permit area. That is inconsistent with page 22 of the Fact Sheet, which states:

The EPA has reviewed the information that Powertech provided in the Permit Application and has determined that evidence indicates that except for the northeast corner of Section 1, T7S, R1E, the Fuson member of the Lakota formation is a continuous confining zone underlying the Fall River injection interval and overlying the Chilson Sandstone injection interval throughout the Dewey-Burdock Permit Area.

The statement that "The stability monitoring period in the current NRC license includes 12 months" is inconsistent with NRC license requirements and the description in the Fact Sheet. As stated correctly on page 99 of the Fact Sheet, the stability monitoring period must be conducted "until the data show that the most recent four consecutive quarters indicate no statistically significant increasing trend for all constituents of concern that would lead to an exceedance above the respective standard in 10 CFR Part 40, Appendix A, Criterion 5B(5)" (emphasis added). Powertech requests changing "12 months" to "at least 12 months" in the Draft Aquifer Exemption ROD.

The statement is made that "For the purposes of post-restoration groundwater monitoring under the Class III Area Permit, a contaminant will be any constituent that was not present in the USDW before the ISR process was initiated (as determined by baseline monitoring required under the UIC Class III Area Permit) or any increase of statistical significance above the mean baseline concentration of any constituent present in the USDW." Please refer to general comment #G-4, which describes how the non-endangerment standard of the SDWA prohibits fluid movement from injection only insofar as it would cause a failure of a public water system to comply with health-based limits for contaminants. Powertech requests updating this discussion to indicate that the Class III Area Permit would prohibit migration of a contaminant into a USDW if the presence of such contaminant may cause a violation of any primary MCL or may otherwise adversely affect the health of persons. Further, Powertech requests replacing post-restoration groundwater monitoring with geochemical modeling using site-specific data, as requested in **Attachment A-3**.

The statement that "once wellfield groundwater reaches a down-gradient contaminant boundary, there is a three-year period of stability monitoring to evaluate whether ISR contaminant concentrations are demonstrating an increasing trend which might result in violation of groundwater baseline levels at the down-gradient AE boundary" does not appear to be consistent with Part IX, Section E.13.c of the draft permit or Section 12.10 (page 123) of the fact sheet, which specify that post-restoration monitoring must continue for at least 2 years after arrival of the groundwater and until the most recent four consecutive samples indicate no statistically significant increasing trend that would lead to an exceedance above the permit limit. Powertech requests that EPA update the discussion for internal consistency. Further, Powertech requests replacing post-restoration groundwater monitoring with geochemical modeling using site-specific data, as requested in **Attachment A-3**.

Powertech requests correcting the statement that "In addition to these taste and odor concerns, Inyan Kara wells completed within the ore zone also have radium, gross alpha and radon concentrations above MCLs." First, Table 17.8 in the Class III permit application shows that several wells also exceeded uranium MCLs. Second, Powertech notes that there is no radon MCL, although nearly all wells exceed EPA's formerly proposed MCL of 300 pCi/L.

EPA Notes/Response

Comment type key: A – alternate approach proposed;
C – correct to be consistent with application, regulations or NRC license requirements;
E – additional explanation requested;
I – inconsistency (internally inconsistent between parts of Draft permit or supporting documents);
R – remove; inconsistent with application, regulations or NRC license requirements;
T – typographical error

Proposed Alternate Solution to Core Sampling

Problem:

Part II, Section D.5 of the Draft Class III Area Permit would require Powertech to collect at least two cores from down-gradient locations within each wellfield prior to ISR operations. According to Part IV, Section D of the draft permit, these core samples would be tested using laboratory bench-scale column tests after groundwater restoration has been completed in the wellfield. Following are specific technical comments on the proposed permit conditions followed by a proposed alternate solution.

A-1-1:

The requirement to collect core samples prior to operations adds unnecessary expense. Figure 6.1-1 in the approved NRC license application depicts the anticipated project schedule on a wellfield-by-wellfield basis. Depending on the wellfield size, the anticipated timeline from initial construction of an individual wellfield through operations, groundwater restoration, stability monitoring, and regulatory approval of groundwater restoration is about 5 to 9 years. Storing core samples from 14 wellfields for 5 to 9 years would cause undue financial burden on Powertech. Samples would have to be stored frozen and under a nitrogen atmosphere, which would be very expensive. In addition, the core samples would have been collected from a licensed source material facility and would be considered source material by NRC. Many laboratories do not have the appropriate licensing to store source material, and those that do are limited in the quantity that can be stored at any one time. This would restrict the number of potential storage facilities and drive up the cost even further.

A-1-2:

The requirement to store core samples for 5 to 9 years risks compromising the integrity of the samples. The longer the storage duration, the greater the risk of a power outage, lab closure, or other event leading to a disruption of the controlled storage environment. Further, it is virtually impossible to collect core samples completely free of oxygen, and any entrained oxygen would have years to react with the material prior to testing.

A-1-3:

As described in comment #A-5-5, limiting testing methods used to establish site-specific data to laboratory column testing is contrary to research cited in the Draft Class III Area Permit Fact Sheet and would not allow Powertech to take advantage of advancing research methodologies.

Proposed Alternate Solution:

As described in Attachment A-3, Powertech proposes to conduct geochemical modeling using site-specific data to evaluate the geochemical stability of the production zone and the possibility that contaminants could be released from the restored production zone to the aquifer exemption boundary and cause a violation of MCLs or otherwise adversely affect human health. Powertech requests that such site-specific data not be limited to column testing using core samples, since that would not allow Powertech to take advantage of advancing research methodologies. The geochemical modeling procedures and collection of site-specific data would be documented in the Closure Plan, which would be submitted to EPA for review and approval.

In the event that core sampling is required, to solve the economic and technical feasibility issues associated with long-term storage and delayed testing of core samples, Powertech requests that the permit allow the flexibility to collect core samples at any time prior to conducting laboratory-scale bench testing and from any down-gradient locations within the aquifer exemption boundary that can be shown to be unaffected by ISR operations. This would include locations down-gradient from perimeter monitoring wells that never experienced an excursion during operation, which would be the vast majority of down-gradient wells based on the limited number of excursions that have occurred at operating ISR facilities. Collecting core samples as soon as practicable before testing would minimize the risk of the loss of core integrity and help ensure that the most representative in-situ conditions are used during testing. This would be consistent with various recent research studies on natural attenuation, none of which waited 5 to 9 years between core sample collection and laboratory testing.

EPA Notes/Response

Proposed Alternate Solution to Locating Down-gradient Compliance Boundary Monitoring Wells

Note:

As described in Attachment A-3, Powertech has proposed an alternate solution to post-restoration groundwater monitoring. In the event that this solution is not approved, this proposed alternate discusses proposed revisions to the location of down-gradient compliance boundary monitoring wells.

Problem:

Part IV, Section B.2 of the Draft Class III Area Permit would require down-gradient compliance boundary (DGCB) monitoring wells to be located "anywhere between the down-gradient portion of the wellfield perimeter monitoring well ring and the down-gradient wellfield boundary." Following are specific technical comments on the proposed permit conditions followed by a proposed alternate solution.

A-2-1:

Requiring a new set of wells between the wellfield and down-gradient perimeter monitoring wells would cause an undue financial burden in terms of:

- Well installation (at least 200-300 additional wells would be needed)
- Pre-operational baseline sampling
- Pump testing to verify each well is in hydraulic communication with the wellfield and to estimate time of travel to each well under natural groundwater flow conditions
- The need for the down-gradient monitoring wells since there has never been a documented off-site impact to non-exempt groundwater (refer to general comment #G-1)

As described in comment #G-14, Powertech estimates that the additional incremental costs for the DGCB monitoring wells, post-restoration groundwater monitoring and other groundwater monitoring that would be required by the draft permit above and beyond that required by NRC license conditions and commitments in Powertech's approved NRC license application and Class III permit application are estimated to be approximately $30 million over the life of the project. This includes the costs of additional well construction and reclamation, labor and equipment to collect samples, costs of laboratory analytical work, geochemical modeling and core collection/column testing. It is based on very conservative durations of post-restoration groundwater monitoring (assuming pumping) and does not consider the added cost for maintaining financial responsibility and lease agreements for several additional years. These additional costs are not incurred by any existing or previously permitted uranium ISR project. This would represent a substantial increase in the overall life-of-mine project costs, equating to as much as a 10% increase in the unit cost of yellowcake produced, resulting in an economic burden and competitive disadvantage for Powertech. It should be added that these costs are highly dependent on the timeline for which groundwater restoration/stability is completed and approved by regulatory agencies and could increase significantly.

Of this cost, about $7 million is attributed to installing DGCB monitoring wells separate from the perimeter monitoring well ring, conducting baseline pump testing and water quality characterization prior to ISR operations and reclaiming the additional wells. In other words, it would cost about $7 million more to install the DGCB monitoring wells separate from the perimeter monitoring wells as compared to using the perimeter monitoring wells for post-restoration groundwater monitoring, if required.

A-2-2:

Installing 200-300 additional DGCB monitoring wells would result in additional surface disturbance in an area that otherwise would be left almost entirely undisturbed throughout the project (i.e., the disturbance buffer area between the fenced wellfield pattern area and perimeter monitoring well ring). Assuming a typical disturbance area of 4,900 square feet (0.1 acre) per well (70-foot x 70-foot well pad), the total estimated additional disturbance is 22 to 34 acres. This represents 9 to 14% additional surface disturbance compared to the total estimated surface disturbance of 243 acres for the Class V injection well wastewater disposal option.

A-2-3:

Installing what would amount to a second monitoring "ring" extending around a portion of each wellfield could be confusing to the public and various agencies for compliance monitoring purposes. For example, it could lead to questions as to why excursion monitoring is required at one set of wells but not the other. Also, ISR operators often install trend wells for internal (non-compliance) data gathering purposes between the wellfield pattern area and perimeter monitoring well ring, and those could be confused with DGCB monitoring wells by the public or regulators. The requirement could hinder Powertech's ability to install trend wells without having them construed as compliance wells.

A-2-4:

Down-gradient compliance boundary monitoring wells are already required by NRC license requirements. Down-gradient perimeter monitoring wells must be installed prior to operations, sampled for baseline water quality, determined to be in communication with the wellfield through pump testing and monitored throughout ISR operations and groundwater restoration.

A-2-5:

Powertech has identified areas with the highest uranium mineralization and will develop wellfields in those areas. However, it is likely that uranium mineralization exists outside of the wellfield boundaries that potentially impacts water quality. Such variations may cause difficulty in baseline characterization for additional DGCB monitoring wells because of proximity to the wellfield. These types of variability are much less likely to occur in the perimeter monitoring ring wells, since they will be 400 feet distant from the edge of the wellfield.

Proposed Alternate Solution:

Powertech requests the flexibility to use only perimeter monitoring wells for post-restoration groundwater monitoring, if required. This would have the following advantages compared to the requirement to install separate monitoring wells for this purpose:
1) No additional wells would need to be installed, which would save on drilling costs, surface disturbance, drill rig emissions, and other potential impacts related to significantly increasing the number of monitoring wells.
2) No additional pre-operational baseline sampling would be required, since the NRC license requires comprehensive characterization of the pre-operational water quality in perimeter monitoring wells. If EPA requires additional parameters to be analyzed, this could be done without collecting separate samples.

3) No additional pump testing would be required, since the NRC license and draft Class III permit conditions both require Powertech to demonstrate that perimeter monitoring wells are in hydraulic communication with the wellfield pattern area. In addition, the information gathered through pump testing would allow Powertech to estimate the average linear groundwater flow velocity and corresponding travel time to each DGCB monitoring well, as required by Part IV, Section B.6 of the draft permit.

4) Locating the DGCB monitoring wells at the perimeter monitoring ring would make it less likely that the wells would be impacted by an operational excursion, since they would be farther away from the wellfield. Moreover, the added distance would help ensure that only excursion parameters would potentially affect the well, since those parameters advance ahead of reactive constituents in any outwardly moving plume. Due to their highly mobile and less reactive nature, excursion parameters such as chloride would advance ahead of constituents of concern such as uranium. In general, the farther the distance of travel the greater the separation between the early warning constituents and contaminants that could cause a violation of MCLs or otherwise adversely affect human health. With distances of 400-500 feet at historically operated ISR facilities, this early warning system has proven effective for many decades. This is described in the NRC SEIS for the Moore Ranch ISR Project (Exhibit 017 at p. B-75):

NRC does not define an excursion as contamination that moves into a USDW. An excursion is defined as an event where a monitoring well in overlying, underlying, or perimeter well ring detects an increase in specific water quality indicators, usually chloride, alkalinity and conductivity, which may signal that fluids are moving out from the wellfield. These specific water quality parameters are used because they are present in high concentrations in the ISR production fluids and are "conservative" in the sense that they move at roughly the same rate as the groundwater flow and are not significantly attenuated by adsorption or reduced by other factors. Therefore, they serve as early indicators of imbalance in the wellfield flow system to notify operators to take appropriate actions. The perimeter monitoring wells are located in a buffer region surrounding the wellfield within the exempted portion of the aquifer. These wells are specifically located in this buffer zone to detect and correct an excursion before it reaches a USDW. The overlying and underlying monitoring wells are located in aquifers that are separated from the ore zone by aquitards, which NRC has determined have sufficient thickness and integrity to prevent an excursion. However, in all cases, any excursion that lasts longer than 60 days is required to undergo corrective action to meet the drinking water protection standards in 10 CFR Part 40, Appendix A 5(B) 5. To date, no excursions from an NRC-licensed ISR facility has contaminated a USDW.

5) Locating the down-gradient compliance monitoring wells farther from the wellfield would increase the opportunity for natural attenuation of impacted groundwater due to the longer distance.
6) Verification that the down-gradient compliance monitoring wells are not impacted by ISR solutions prior to post-restoration groundwater monitoring would be demonstrated through the excursion monitoring program that would be implemented from the onset of operations through groundwater restoration. As described in Section 3.3.2.1 of the Draft Cumulative Effects Analysis, "The monitoring well detection system described in Section 12.5 of the Class III Area Permit Fact Sheet is a proven method used at historically and currently operated ISR facilities." Existing NRC license conditions and Class III permit requirements would necessitate correcting any horizontal excursion long before the onset of post-restoration groundwater monitoring. As described previously, excursion monitoring is designed to provide early detection of non-hazardous indicator parameters (chloride, specific conductance and total alkalinity) before any contaminant reaches the well that could cause a violation of any primary drinking water regulation or otherwise adversely affect human health.

7) The buffer area between the perimeter monitoring well ring and the aquifer exemption boundary would provide flexibility to install additional down-gradient compliance wells if needed (e.g., if a statistically significant increase of a contaminant concentration were detected in a well during post-restoration groundwater monitoring).
8) The stated purpose of down-gradient monitoring is "to verify that no ISR contaminant will cross the aquifer exemption boundary" (e.g., Section 5.5 of the Draft Class III Area Permit Fact Sheet). The down-gradient perimeter monitoring wells are positioned to satisfy this purpose. Any well location that is down-gradient of the wellfield and within the aquifer exemption boundary would be suited to this purpose.
9) Since there has never been a documented occurrence of off-site impact to non-exempt groundwater in decades of U.S. ISR operations (general comment #G-1), there is no documented need for post-restoration groundwater monitoring down-gradient from the wellfield. Therefore, using existing down-gradient wells for this monitoring, if required, would not lessen any known risk of contamination.

10) Having only one set of down-gradient wells to monitor for potential excursions during operations and to verify that no contaminants will cross the aquifer exemption boundary and cause a violation of MCLs or otherwise adversely affect human health after groundwater restoration would significantly simplify the monitoring scheme and make it more understandable to members of the public, Powertech operators, and various regulatory agencies such as NRC, EPA, and SD DENR. It would also keep the monitoring well network consistent with other U.S. ISR operations, including those in EPA Region 8.

Proposed Alternate S[redacted]

Problem:

A-3-1:

A-3-2:

A-3-3:

A-3-4:

A-3-5:

A-3-6:

A-3-7:

A-3-8:

Proposed Alternate
Solution:

Alternate Solution to Post-restoration Groundwater Monitoring

Part IX, Section E of the Draft Class III Area Permit would require post-restoration groundwater monitoring for each wellfield after NRC approval that groundwater restoration has been successfully completed in accordance with the standards in 10 CFR Part 40, Appendix A, Criterion 5B(5). From a regulatory standpoint, the duplicative down-gradient compliance monitoring is not required, considering that the NRC license already requires Powertech to monitor down-gradient perimeter monitoring wells during ISR operations and groundwater restoration. From a human health standpoint, existing NRC license requirements have been demonstrated to be protective of human health and the environment (refer to General Comment #G-1). NRC's determination to this effect is found in the Dewey-Burdock Project SER (**Exhibit 014** at 93):

The staff conducted a detailed review and evaluation on the proposed ISR process and equipment presented in the application and found they are acceptable. License conditions will impose additional inspections, data collection, and reporting requirements on the applicant and provide additional assurance. The staff finds sections reviewed are consistent with the acceptance criteria of standard review plan Section 3.1.3 and comply with 10 CFR 40.32(c), which requires the applicant's proposed equipment, facilities, and procedures to be adequate to protect health and minimize danger to life or property. The staff also finds the proposed operations comply with 10 CFR 40.41(c), which requires the applicant to confine source or byproduct material to the location and purposes authorized in the license. Staff finds that the proposed ISR operations are consistent with NRC-accepted practices and are consistent with operations employed safely at existing NRC-licensed facilities. Based on commitments in the application and the license conditions identified above, NRC staff concludes that the applicant will be able to operate the ISR process in a manner that is safe for workers and the public health and safety and the environment.

From technical and economic standpoints, the proposed post-restoration groundwater monitoring requirements are infeasible based on the following comments.

Time of Travel under Natural Groundwater Conditions

Figure A3-1 shows the approximate configuration of Dewey Wellfield 1, as depicted in Plate 7.1 of the Class III permit application, along with the natural groundwater flow direction from Figure 5.2 in the Class III permit application. This figure shows that the natural groundwater gradient closely follows the longitudinal wellfield axis, much more so than what is depicted in Figure B4 in the Draft Class III Area Permit. The result is that the distance along the natural groundwater flow path between the wellfield and potential DGCB monitoring wells is much farther than the offset distance of the DGCB wells from the wellfield.

This is illustrated in Table A3-1, which compares the distance along the natural groundwater flow path from the down-gradient edge of the wellfield to potential DGCB monitoring wells placed either 200 or 400 feet from the wellfield. The distance of groundwater travel ranges from 200 to 3,078 feet for wells placed 200 feet from the pattern area and 400 to 3,570 feet for wells placed 400 feet from the pattern area. Based on the average Fall River groundwater flow velocity of 6.1 feet per year, from Appendix 6.1-A (numerical groundwater flow model) of the approved NRC license application (Exhibit 018 at p. 6.1-A-11), it would take 33 to 505 years for groundwater to reach DGCB monitoring wells placed 200 feet from the wellfield or 66 to 585 years to reach wells placed 400 feet from the wellfield. Since the draft permit would require verification that the tracer reaches each DGCB monitoring well, it would be necessary to wait at least 500 years for groundwater to reach the most distant wells under natural groundwater flow conditions.

Table A3-1. Distance and Time of Travel to Down-gradient Wells from Dewey Wellfield 1

Well No.[1]	Scenario A – Wells Placed 200 Feet from Wellfield (Halfway to Perimeter Monitoring Wells)		Scenario B – Wells Placed 400 feet from Wellfield (Perimeter Monitoring Wells)	
	Down-Gradient Distance (feet)	Time of Travel[3] (years)	Down-Gradient Distance (feet)	Time of Travel[3] (years)
1	1,395	229	N/A[2]	---
2	1,270	208	N/A[2]	---
3	373	61	1,924	315
4	426	70	816	134
5	200	33	400	66
6	375	61	2,761	453
7	2,689	441	3,570	585
8	3,078	505	3,397	557
9	2,702	443	3,002	492
10	2,402	394	2,602	427
11	2,002	328	N/A[2]	---
12	1,585	260	N/A[2]	---
13	1,371	225	N/A[2]	---
14	972	159	N/A[2]	---
Average	1,489	244	2,309	379

Notes:

[1] Refer to Figure A3-1 for well locations.

[2] Well location is not down-gradient under natural groundwater flow direction.

[3] Time of travel calculated using 6.1 feet per year average Fall River aquifer groundwater velocity from Appendix 6.1-A (numerical groundwater flow model) of the approved NRC license application (Exhibit 018 at p. 6.1-A-11).

Given that Dewey Wellfield 1 would be about 4,700 feet long, the travel time from the upgradient edge of the wellfield to potential DGCB monitoring wells would be hundreds of years for any well. Figure A3-1 shows that the minimum distance would occur for potential DGCB monitoring well location 2, southwest of the wellfield. Even this minimum distance is more than 2,600 feet, corresponding to a travel time of 400 to 500 years. If it were necessary to inject a tracer at the northernmost point in the wellfield, such that it would travel through the entire wellfield en route to a DGCB monitoring well, it would have to travel a distance of about 5,000 feet. This would take about 800 years under natural groundwater flow conditions. Clearly such travel times are technically infeasible regardless of how far the DGCB monitoring wells are placed from the wellfield.

Interference from Other Wellfields

EPA has not considered potential interference from nearby wellfields in the proposed post-restoration groundwater monitoring requirements. There are many instances of adjacent or nearby wellfields targeting the same aquifer or sub-aquifer unit for uranium recovery and groundwater restoration (e.g., Dewey Wellfields 1 and 3 both target the Lower Fall River and Burdock Wellfields 1, 2, 4, 6 and 7 all target the Middle/Lower Chilson). Since wellfield development would be phased, generally it would not be possible to conduct post-restoration groundwater monitoring under natural groundwater flow conditions for one wellfield until all ISR operations and groundwater restoration are completed in nearby wellfields targeting the same aquifer. This is illustrated in Appendix 6.1-A (numerical groundwater flow model) of the approved NRC license application (Exhibit 018 at pp. 6.1-A-101 through 102). The modeling results show that the potentiometric surfaces of the Fall River and Chilson aquifers will not recover to pre-operational levels until 1 to 2 years after the end of groundwater restoration in all wellfields. Prior to this time, the direction of groundwater flow in the vicinity of each wellfield will be influenced by operation and restoration bleed in other wellfields, which would impact which DGCB monitoring wells would actually be down-gradient of the wellfield. Conducting post-restoration groundwater monitoring, including tracer tests, prior to the project-wide end of ISR operations and groundwater restoration would be technically infeasible as natural groundwater flow conditions would not exist until the cone of depression for each wellfield has fully recovered to baseline (pre-ISR) conditions.

The draft permit also does not include any provisions to address instances where one wellfield occurs down-gradient from another wellfield targeting the same aquifer (e.g., Burdock Wellfield 2 is down-gradient from Burdock Wellfields 1 and 4; Burdock Wellfield 1 is also down-gradient from Burdock Wellfield 6). Occurrences of multiple wellfields in close proximity targeting the same aquifer make the proposed requirement to conduct post-restoration groundwater monitoring on an individual wellfield basis technically infeasible in certain situations. For example, a tracer test conducted at the down-gradient edge of Burdock Wellfield 4 would have to flow through Burdock Wellfield 2 before reaching a DGCB monitoring well. This could lead to confusion for Powertech and regulators regarding the approval status of a wellfield. For instance, if Burdock Wellfield 2 achieved regulatory approval for successful post-restoration groundwater monitoring, but later a statistically significant increase was observed during post-restoration groundwater monitoring of Burdock Wellfield 4 using the same DGCB monitoring well, would this reopen the approval status of Burdock Wellfield 2?

Lag between Tracer and Reactive Constituents

EPA has not considered the lag in the travel time between arrival of the conservative tracer (chloride) and reactive constituents (e.g., uranium). The Johnson and Tutu reactive transport model cited in the Draft Class III Area Permit Fact Sheet shows that it will take hundreds of years longer for a reactive constituent (affected by sorption) to reach a down-gradient perimeter monitoring well compared to a conservative constituent (no sorption). This lag does not seem to have been considered in the proposed requirement to conduct post-restoration groundwater monitoring for 2 years after arrival of the tracer. Unless the post-restoration groundwater monitoring period were extended for 100 years or more, there is very little chance that uranium and other reactive constituents would be detected according to research included in the fact sheet. Monitoring for hundreds of years would be technically and economically infeasible.

Reduced Attenuation Capacity if Pumping Is Used

As a potential remedy for hundreds of years of post-restoration groundwater monitoring under natural groundwater flow conditions, the draft permit would allow the flexibility to pump the DGCB monitoring wells to decrease the travel time. This is a technically infeasible alternative, since it could impact the ambient groundwater conditions and affect geochemical reactions that would attenuate the concentration of uranium and other reactive constituents in the buffer area between the wellfield and the aquifer exemption boundary. Pumping will change ambient conditions by pulling in groundwater not only from the wellfield but also from all other directions toward the pumped well. A change in pH or an increase or decrease in the carbonate concentrations could significantly impact the rate and extent of sorption reactions. Any type of pumping could change geochemical conditions, particularly for reductive-driven precipitation reactions. Pumping also may inadvertently introduce more oxygen or other oxidants along the flow path, and these oxidants may hinder formation of reduced minerals of uranium and other constituents or dissolve previously formed uraninite (UO2). Effectively, EPA is proposing to pull any impacted groundwater remaining in the wellfield toward the aquifer exemption boundary in order to verify that no contaminants cross the aquifer exemption boundary. If a larger buffer area were available between the perimeter monitoring well ring and the aquifer exemption boundary, as originally proposed by Powertech, it might be feasible to pump groundwater to the perimeter monitoring well ring (see Attachment A-10 for a proposed alternate aquifer exemption boundary). However, since very little buffer area is provided, this alternative is technically infeasible and likely to result in contaminants being detected at DGCB monitoring wells that otherwise would attenuate under natural groundwater flow conditions.

Monitoring Is Unnecessary Due to the NRC Groundwater Restoration Approval Process

As described in Section 10.8.1 of the Class III permit application, Powertech will be required by NRC license condition and federal regulation to restore groundwater in each wellfield to satisfy the groundwater quality standards in 10 CFR Part 40, Appendix A, Criterion 5B(5). This requires restoration to baseline (background) or an MCL, whichever is higher, or an alternate concentration limit (ACL). These groundwater protection standards are designed to ensure that

the concentrations at the point of compliance (POC) – within the wellfield – protect human health and the environment at the point of exposure (POE) – at the aquifer exemption boundary. In particular, in order to approve an ACL application, NRC must determine that there will be no migration of recovery solutions outside of the aquifer exemption boundary. This is clarified in Appendix B of the NRC SEIS (**Exhibit 008** at p. B-3, emphasis added):

Before an ISR licensee is allowed to extract uranium, the U.S. Environmental Protection Agency (EPA) under 40 CFR 146.4 and in accordance with the Safe Drinking Water Act must issue an aquifer exemption covering the portion of the aquifer in which the uranium-bearing rock is located. EPA cannot exempt the portion of the aquifer unless it is found that "it does not currently serve as a source of drinking water" and "cannot now and will not in the future serve as a source of drinking water." Due to these criteria, only impacts outside of the exempted aquifer are evaluated. In most cases, the water in aquifers adjacent to the uranium ore zones does not meet drinking water standards. <u>The staff will not approve an ACL if it will affect any adjacent USDWs.</u>

More information on the ACL approval process is provided in the National Mining Association's comments on the previously proposed 40 CFR Part 192 rulemaking (**Exhibit 009** at p. 13, emphasis added):

In the event a licensee determines that an ACL is warranted, it is required to submit a wellfield-specific license amendment application to NRC for its review and approval, including a mandatory technical/safety and environmental review, production of a safety evaluation report (SER) and, at a minimum, an environmental assessment (EA), and notice of an opportunity for an administrative hearing before the Atomic Safety and Licensing Board (ASLB). An ACL is a site-specific (wellfield-specific), constituent-specific, risk-based human health standard that addresses thirteen specific requirements, including satisfaction of the ALARA standard, that the Commission will consider when evaluating an ACL license amendment application. Such a license amendment application is required to include an affirmative demonstration by the licensee that all of Criterion 5B(6) standards for ACLs have been met, including the ALARA standard, showing that the licensee has attempted to restore groundwater within the depleted ore body to primary or secondary restoration goals in Criterion 5B(5). <u>In accordance with ACL requirements, the licensee also must demonstrate that the values calculated for ACLs and the geochemistry in the depleted ore body will be adequately protective of human health and the environment at the POE – i.e., will not pose a substantial present or future hazard.</u>

A Second Round of Post-Restoration Groundwater Monitoring Is Unwarranted

Page 123 of the fact sheet describes the proposed requirement "to evaluate the potential impacts of groundwater located upgradient of the restored wellfield to mobilize any ISR contaminants ... to ensure that no rebound of contaminant concentrations occurs once the upgradient groundwater passes through the portion of the injection zone aquifer located down-gradient of the restored wellfield." This does not seem to consider that a cone of depression is maintained in each wellfield during ISR operations and groundwater restoration, which causes a continuous influx of groundwater from upgradient areas surrounding each wellfield into the wellfield. Due to this continuous intermixing of water within the restored wellfield with up-gradient water from the surrounding aquifer, there is no basis for an assumption that there would be a significant shift in geochemical conditions following groundwater restoration. Further, Powertech's NRC license allows for conducting groundwater sweep during groundwater restoration, which will draw native groundwater into the mining zone by pumping production wells without injection.

Post-Restoration Groundwater Monitoring Requirements Are Inconsistent with EPA Unified Guidance

The proposed post-restoration groundwater monitoring requirements are inconsistent with EPA Unified Guidance (Exhibit 019) with respect to the following issues:

a) The proposed monitoring requirements should use **detection monitoring** (i.e., to determine whether a release to groundwater with the potential to reach the aquifer exemption boundary occurs) **rather than compliance/assessment monitoring** (i.e., under the assumption that the monitoring location has been contaminated unless demonstrated to be significantly below the groundwater protection standards). As described on page 2-2 of the EPA Unified Guidance:

Detection monitoring is the first stage of monitoring when no or minimal releases have been identified, designed to allow identification of significant changes in the groundwater when compared to background or established baseline levels.

EPA Unified Guidance further notes on page 2-10 that:

Units under detection monitoring are initially presumed not to be contributing a release to the groundwater unless demonstrated otherwise.

This is exactly the scenario that would occur under post-restoration groundwater monitoring. The restored wellfield, approved by NRC as meeting applicable regulatory requirements, should be presumed to not be contributing a release to the aquifer exemption boundary unless demonstrated otherwise. Therefore, it is more appropriate to employ detection monitoring during post-restoration groundwater monitoring and only transition to compliance/assessment monitoring if a release of a contaminant is confirmed at a DGCB monitoring well.

b) Using the full suite of Table 8 parameters is inconsistent with EPA Unified Guidance for detection monitoring. As stated on page 6-9 of EPA Unified Guidance, the number of constituents should be limited in order to control the site-wide false positive rate (emphasis in original):

To help balance the risks of false positive and false negative errors, the number of statistically-tested monitoring parameters should be limited to constituents thought to be reliable indicators of a contaminant release ... Some means of reducing the number of tested constituents is generally necessary to design an effective detection monitoring system.

Detection monitoring should focus on those constituents known to be present above background concentrations following groundwater restoration, which can only be determined following groundwater restoration. If post-restoration groundwater monitoring is required, Powertech requests flexibility to submit the parameter list to EPA for review and approval.

c) Use of an increasing trend for detection monitoring is inconsistent with EPA Unified Guidance, which does not recommend trend tests as formal detection monitoring tests. It describes how trend tests are more commonly "applied to background data prior to implementing formal detection monitoring tests" (page 6-41).

d) The proposed retesting strategy is similar to that used for excursion monitoring, in that the 2nd and 3rd samples must not show a statistically significant increase (SSI) in order for the 1st sample to be considered an error. Although this type of retesting strategy works for excursion monitoring, where the UCLs are set relatively high above baseline, it does not work for detection monitoring, where the detection limits would be set much closer to average background concentrations. This would likely lead to excessive false positives. Instead, EPA Unified Guidance recommends a "1-of-m" retesting strategy, in which "all m values must be larger than the prediction limit [or other test statistic] to be declared an exceedance" (page 6-44). Thus, if two samples were collected during retesting, all three samples (original plus two retesting samples) would have to exceed the detection limit in order to confirm an SSI.

A-15

e) The retesting strategy also involves spacing samples only 48 hours apart using low-flow sampling techniques under the natural groundwater gradient (some 5-10 feet/year). While closely spaced sampling intervals work during ISR operations, when a relatively steep gradient would have caused the excursion compared to natural conditions, such intervals are not appropriate for detection monitoring under natural groundwater flow conditions, since they would not yield statistically independent samples. EPA Unified Guidance recommends retesting on the same sampling schedule as routine samples are collected (in this case quarterly or semiannually). Given that post-restoration groundwater monitoring would have to be carried out for decades at a minimum, there would be no need for closely spaced retesting.

Economic and Land Use Impacts Have Not Been Considered

Previous comments have shown that post-restoration groundwater monitoring could not feasibly start under natural groundwater flow conditions until after the end of project-wide ISR operations and groundwater restoration. They have also shown that the duration of post-restoration groundwater monitoring under natural groundwater flow conditions would be several decades at a minimum and more likely centuries. This would require Powertech to maintain lease agreements with all of the affected landowners for decades or centuries. It would also cause long-term access restrictions to lands occupied by ISR wellfields, access roads, and processing facilities. Section 12.5 of the Draft Cumulative Effects Analysis describes how added county road maintenance costs would be offset by increased tax revenues for Custer and Fall River counties; however, extending project-related vehicle traffic for well sampling and equipment maintenance for decades or centuries during post-restoration groundwater monitoring would add traffic and road maintenance needs without any tax revenues from uranium production. It would also require Powertech to maintain financial assurance for decades or centuries encompassing virtually the entire project (wellfields, processing facilities, pipelines, etc.), which would pose a significant financial hardship on the company and will likely make the entire project economically infeasible.

Powertech requests the ability to prepare a Closure Plan that will be submitted to EPA for review and approval following NRC approval of groundwater restoration in the first wellfield. The Closure Plan will be updated or a new Closure Plan prepared for each subsequent wellfield. The Closure Plan will document groundwater restoration efforts, stability monitoring results, and NRC correspondence during the approval process. This would include documentation of NRC staff's rigorous review process for any ACLs to determine that the ACL does not pose a potential hazard to human health or the environment. **As described in Appendix B of the NRC SEIS, this review process includes three risk assessments:** **1)** a hazard assessment to evaluate the radiological dose and toxicity of the constituents in question and the risk to human health and the environment; **2)** an exposure assessment to examine the existing distribution of hazardous constituents, potential sources for future releases and potential consequences associated with the human and environmental exposure to the hazardous constituents; and **3)** a corrective action assessment to identify the preferred corrective action to achieve the hazardous constituent concentration that is protective of human health and the environment (**Exhibit 008** at p. B-1).

Following the completion of each major wellfield area (i.e., the Dewey area or the Burdock area), the Closure Plan will be updated to include an integrated hydrologic and reactive transport (geochemical) model encompassing all restored wellfields in that area. The model will evaluate the geochemical stability of the production zone and the possibility of release of constituents from the restored production zone to the aquifer exemption boundary. Geochemical modeling using site-specific data would be far superior to post-restoration groundwater monitoring to demonstrate that there will be no threats to human health or the environment at the aquifer exemption boundary. Following are specific advantages to the requested modeling approach:

1) Geochemical modeling is the state of the art approach to demonstrate that there will be no detrimental impacts at the aquifer exemption boundary as part of the ACL application process to NRC for NRC-licensed ISR facilities. This is supported by the following statements by EPA in the previously proposed but discarded 40 CFR part 192 rulemaking:

a. "Geochemical modeling can provide a defensible demonstration of an aquifer's natural capacity to maintain stability, which statistics alone cannot provide." (Exhibit 007 at p. 4172)

b. "We believe that modeling … can provide confidence that a geochemical environment exists to prevent uranium and other constituents from remobilizing …" (**Exhibit 007** at p. 4177)

c. "Background data are also needed for geochemical modeling of the groundwater in the production zone and downgradient to support assessments of the natural capacity of the restored production area and downgradient portion of the exempted aquifer to maintain long-term stability of the restored wellfield." (**Exhibit 007** at p. 4174)

NRC staff also performed geochemical fate and transport modeling as part of its review of the groundwater restoration report for the Christensen Ranch Project (now part of the Willow Creek ISR Project) in Wyoming (**Exhibit 020**). The fact that NRC staff did not approve restoration as requested by the operator speaks to the detailed level of review that each ISR wellfield will undergo before receiving NRC approval of successful groundwater restoration.

2) The Closure Plan will provide the ability to evaluate various scenarios related to restoration activities, as well as monitoring strategies and remediation options if required. It would not require decades or centuries to determine whether groundwater restoration efforts are adequate to protect groundwater quality at the aquifer exemption boundary.

For example, consider the scenario where post-restoration groundwater monitoring is required by EPA and that monitoring detects a statistically significant increase after 30 years of post-restoration groundwater monitoring. Based on comment #A-3-1, this would not be an unusual monitoring duration under natural groundwater flow conditions. It is very likely that it would necessitate restarting groundwater restoration efforts in that wellfield. Not only would this be a monumental task in terms of restarting equipment (pumps, pipelines, reverse osmosis units, etc.) that had been idle for decades, but it would necessitate another 30 years of monitoring to see whether the additional groundwater restoration corrected the issue. This lag between adjusting the independent variable (groundwater quality within the wellfield) and determining the resulting change in the dependent variable (down-gradient water quality) makes post-restoration groundwater monitoring technically infeasible. Instead, geochemical modeling would provide predictive concentrations of all constituents of concern at the aquifer exemption boundary at the close of groundwater restoration. This would provide the EPA with the opportunity to review the model and determine whether groundwater would be adequately protected at the aquifer exemption boundary. This review would occur within months of the end of groundwater restoration stability monitoring instead of decades later. If it is determined that additional groundwater restoration efforts are needed or monitoring is required to verify model assumptions, those could be performed relatively quickly and additional assessment performed until EPA is satisfied.

3) Geochemical modeling is already required by the Draft Class III Area Permit. Part IV, Section D.1.e requires "geochemical modeling results demonstrating that no ISR contaminants will cross the down-gradient aquifer exemption boundary" if column testing does not prove that there will be a sufficient decrease in ISR contaminant concentrations. Based on the very narrow definition of what would entail adequate column test results (i.e., no statistically significant increase in the concentration of any constituent during the second set of tests), it is a virtual certainty that geochemical modeling would be required under the draft permit conditions. Further, the draft permit condition requires the model to demonstrate that no ISR contaminants will cross the down-gradient aquifer exemption boundary.

4) The modeling would be based on site-specific data. This could include a variety of data sources such as laboratory testing (e.g., batch sorption testing or column testing), field testing (e.g., cross-hole testing) or other methods. Due to the recent advancements in research technologies, Powertech does not propose to limit the data collection methods to any one method, but proposes to include site-specific data in the Closure Plan, which would be provided to EPA for review and approval.

EPA Notes/Response

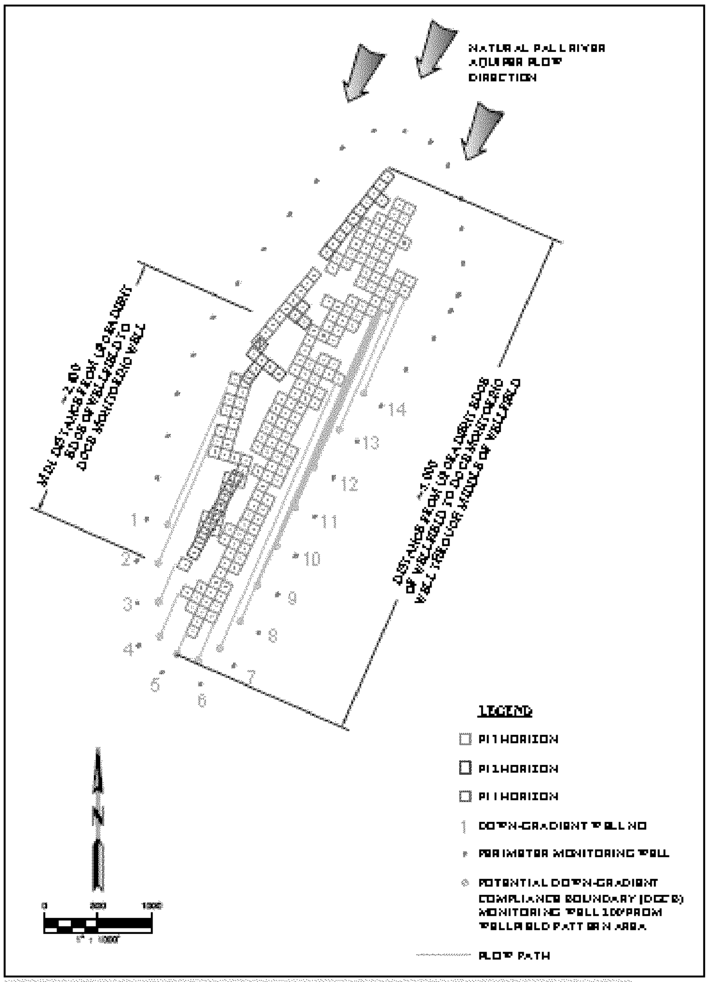

Figure A3-1. Dewey Wellfield 1 Potential Post-Restoration Groundwater Monitoring Wells.

Ex. 5 Deliberative Process (DP)

Ex. 5 Deliberative Process (DP)

Section 1.1 of EPA Unified Guidance describes how detection monitoring is used to “assess whether a hazardous constituent release has occurred,” whereas compliance/assessment monitoring is used to “determine whether measured levels meet the compliance standards.” (from comment A-9-5)

Proposed Alternate S

Note:

Problem:

A-4-1:

A-4-2:

A-4-3:

A-4-4:

A-4-5:

A-4-6:

Proposed Alternate Solution:

Alternate Solution to Establishing Baseline Water Quality for Down-gradient Compliance Boundary Monitoring Wells

As described in Attachment A-3, Powertech has proposed an alternate solution to post-restoration groundwater monitoring. In the event that this solution is not approved, this proposed alternate discusses proposed revisions to the establishment of baseline groundwater quality for down-gradient compliance boundary (DGCB) monitoring wells.

Part IV, Section C and Part IX, Section B.3 of the Draft Class III Area Permit contain proposed monitoring requirements to establish and update baseline concentrations in DGCB monitoring wells. Following are specific technical comments on the proposed permit conditions followed by a proposed alternate solution.

Part IV, Section C.1 and Part IX, Section B.3 of the Draft Class III Area Permit would require Powertech to collect quarterly groundwater samples from the DGCB monitoring wells in order to establish initial baseline values before injection begins in the wellfield. Quarterly sampling prior to operations is inconsistent with NRC license requirements for other monitoring wells in the same monitoring interval. License Condition 11.3 in NRC license SUA-1600 requires Powertech to establish Commission-approved background groundwater quality for the ore zone and perimeter monitoring areas according to the commitments in Section 5.7.8 of the approved NRC license application. That section requires Powertech to collect four samples from each well spaced at least 14 days apart. NRC reviewed Powertech's justification for the 14-day sampling interval in Section 5.7.9.3.1 of the Safety Evaluation Report (SER) and determined that it complied with NRC guidance and regulations in 10 CFR Part 40, Appendix A, Criteria 5B(5), 7, and 7A (Exhibit 014 at p. 179). In order to comply with the NRC license and proposed Draft Class III Area Permit, Powertech would sample wells in the ore zone and perimeter monitoring well ring every 14 days for four samples. However, for the DGCB monitoring wells constructed in the same monitoring interval between these other wells, sampling would be required every quarter for four samples. The inconsistent sampling frequency for wells completed in the same aquifer unit would lead to confusion for Powertech, regulators and members of the public. It would also result in unnecessary economic hardship (e.g., delay the onset of production in each wellfield and increase the sampling cost).

Requiring quarterly pre-operational baseline samples is not necessary due to the lack of seasonal variation in groundwater quality in the Fall River and Chilson aquifers. Appendix N of the Class III permit application provides groundwater sampling results from Fall River and Chilson wells throughout the permit area and shows that there was no seasonal variation over the 1 year or more of data collected from each well. This is not surprising given the slow rate of groundwater movement in these bedrock aquifers and the distance to the recharge areas.

Requiring quarterly baseline samples from DGCB monitoring wells would unnecessarily delay the onset of ISR operations in each wellfield. Assuming at least four samples are required prior to operations in order to establish a statistically significant data set for each well, it would take at least 9 months to collect the DGCB monitoring well initial baseline samples prior to operations (four samples separated by 3 months each). This is 7.5 months longer than the minimum sampling duration for all of the other monitoring wells for each wellfield (four samples separated by 2 weeks each = 1.5 months). This would delay the onset of ISR operations in each wellfield by at least 7.5 months.

Requiring quarterly baseline samples from DGCB monitoring wells throughout ISR operations and groundwater restoration, in order to update baseline values prior to establishing final baseline concentrations for post-restoration groundwater monitoring, would result in an unnecessarily large number of samples and unnecessary economic hardship. Figure 6.1-1 in the approved NRC license application depicts the anticipated project schedule on a wellfield-by-wellfield basis. For larger wellfields, it may take 2.5 to 6 years to complete uranium recovery and groundwater restoration. This would result in 10 to 24 additional DGCB monitoring well samples beyond the 4 collected prior to operations, for a total of 14 to 28 samples for larger wellfields. This is significantly higher than the four samples required for all of the other monitoring wells. It is also above the 8 to 10 samples recommended by EPA Unified Guidance before running most statistical tests (**Exhibit 019** at p. 5-3).

The proposed requirement to perform statistical trend analysis and establish final baseline concentrations at the onset of the stability monitoring period (Part IV, Section C.21) does not consider that there may be several years between the onset of stability monitoring and the regulatory approval of groundwater restoration. First, the stability monitoring period will extend for at least four quarters (the requirement in License Condition 10.6 of NRC License SUA-1600 is until the most recent four consecutive quarters indicate no statistically significant increasing trend that would lead to an exceedance above the respective standard in 10 CFR Part 40, Appendix A, Criterion 5B(5)) (**Exhibit 016** at 7). Next, it may take anywhere from 6 months to several years to obtain regulatory approval of groundwater restoration, particularly if an ACL application is in involved, since that would necessitate a license amendment. The risk is that any natural variation in baseline groundwater quality within the DGCB monitoring wells would not be captured during the several years between the onset of stability monitoring and post-restoration groundwater monitoring.

As described in Attachment A-3, the use of compliance/assessment monitoring using the full suite of Table 8 parameters during post-restoration groundwater monitoring is inconsistent with EPA Unified Guidance, which recommends using detection monitoring using a shortened list of parameters and detection limits (prediction limits, tolerance limits or similar).

Post-restoration groundwater monitoring is unnecessary and should not be required. If it is required, Powertech requests being allowed to collect pre-operational baseline samples from the DGCB monitoring wells at the same frequency as all of the other monitoring wells for each wellfield: at least four samples spaced at least 14 days apart. This is consistent with NRC license requirements and would avoid unnecessary delay in the onset of ISR operations in each wellfield. Site characterization baseline sampling throughout the permit area demonstrated that there is no seasonal variation in water quality in the Fall River and Chilson aquifers, which is not surprising given that these are relatively deep, bedrock aquifers.

In order to avoid collecting an unnecessarily large number of samples in order to update baseline during ISR operations and groundwater restoration, Powertech requests the ability to collect annual samples from the DGCB monitoring wells during the baseline monitoring period (i.e., beginning at the onset of ISR operations). Furthermore, in order to avoid having several years of lag between establishing final baseline concentration limits and beginning post-restoration groundwater monitoring, Powertech requests the ability to continue annual sampling until NRC approval of groundwater restoration. Based on a typical anticipated duration of 3.5 to 8 years from the onset of ISR operations through regulatory approval of groundwater restoration, this would yield at least 4 to 8 additional samples, or 8 to 12 total samples used to establish final baseline concentration limits for post-restoration groundwater monitoring. This is consistent with the 8 to 10 samples recommended by EPA Unified Guidance.

Finally, Powertech requests the ability to submit a groundwater detection monitoring plan for post-restoration groundwater monitoring, if required, that would specify the parameters, retesting strategy and detection limits (prediction limits, tolerance limits, or similar) consistent with EPA Unified Guidance.

EPA Notes/Response

Ex. 5 Deliberative Process (DP)

Ex. 5 Deliberative Process (DP)

Proposed Alternate S

Problem:

A-5-1:

A-5-2:

A-5-3:

A-5-4:

A-5-5:

A-5-6:

A-5-7:

Proposed Alternate
Solution:

Alternate Solution to Column Testing

Part IV, Section D of the Draft Class III Area Permit would require laboratory column testing to verify the attenuation capability of the down-gradient injection zone aquifer. Following are specific comments that describe how the proposed column testing requirements are technically infeasible followed by a proposed alternate solution.

The proposed column testing methods are structured as "pass/fail" tests. If there is "an insufficient decrease in ISR contaminant concentrations after passing through the columns" or if there is an increase in any constituent concentration after passing the upgradient water through the columns, then Powertech would be required to submit a groundwater treatment plan and perform geochemical modeling. This approach is inconsistent with methods used in recent studies on natural attenuation of uranium at ISR facilities, including both Raymond Johnson papers cited in the fact sheet. In those cases, laboratory testing (batch sorption testing, column testing, or other methods) was used to establish site-specific inputs for geochemical modeling (i.e., sorption site density). Those studies recognize that one core sample would not have the attenuation capacity to prove that there is a "sufficient decrease in contaminant concentrations after passing through the columns" without geochemical modeling. Instead, the laboratory studies are used to inform geochemical modeling, which would be used to determine whether there is adequate natural attenuation capacity down-gradient to prevent contaminants from crossing the aquifer exemption boundary and cause a violation of any primary MCLs or otherwise adversely affect the health of persons.

There are few commercial laboratories set up to perform these types of attenuation studies. Many can perform bulk and sometimes even column leach tests that will release constituents from a soil or sediment. These typically use aggressive extractions but few can be relied upon for these more subtle procedures. These tests require an almost research laboratory setting where different approaches are developed over time until some method is selected. These types of programs can require years before a consensus is reached among the mining company, its consultants, the laboratory and the various regulatory agencies involved. Therefore, it is not appropriate or possible to specify the exact test procedures within the permit conditions.

Another issue with a "pass/fail" test is that subtle changes in composition can greatly affect the conclusion. For example, changes in pH due to exposure of the leaching solution to the atmosphere or even to an alternative partial pressure of carbon dioxide gas used during the test can result in a corresponding change in the sorption behavior. Also, water to rock proportions in the test can change conclusions. Furthermore, in the case of sorption, these chemical reaction isotherms are never linear. Elevated concentrations may only show slight attenuation in the short flow path within the column, but over distance the concentrations decrease and the percentage of sorped constituent increases such that the final concentrations decrease rapidly. Finally, what happens if some constituents are significantly attenuated and other show slight to no attenuation — is that a failed test?

The proposed requirement to conduct column testing using unrestored groundwater taken from a wellfield before groundwater restoration has begun is unreasonable given that the NRC license conditions and federal regulations require Powertech to conduct groundwater restoration until 10 CFR Part 40, Appendix A, Criterion 5B(5) standards are met. Moreover, Powertech has committed in its approved NRC license application (Sections 6.1.8.1 and 6.1.8.2) to evaluate potential areas of flare or hot spots during active groundwater restoration and stability monitoring. This is described in Section 6.1.8.2 (**Exhibit 010** at p. 6-9a) as follows:

For one or two parameters, localized, elevated concentrations above the restoration criteria may remain in the production zone following restoration. These isolated, residual elevated concentrations are referred to as “hot spots.” The primary indicator of a hot spot for a specific constituent or parameter will be the mean production zone concentration plus two standard deviations. For pH, the indication of a hot spot will be plus or minus two standard deviations. If a constituent or parameter at a production zone baseline sampling well exceeds that criterion during the stability period, the location of the well will be identified as a hot spot. Once a hot spot is identified, additional evaluation will be conducted to determine potential impacts that such a hot spot could have on water quality outside of the exempted aquifer. The additional evaluation may include collection of additional water samples, analysis of added parameters, trend analysis, or flow and transport modeling. Based on the results of the evaluation, additional stability monitoring or restoration may be conducted as needed to ensure the protection of water quality outside the exempted aquifer. If hot spots are sufficiently demonstrated not to have the potential to affect water quality outside of the exempted aquifer and the restoration criteria are otherwise met without increasing trends, then no additional action will be taken and Powertech (USA) will submit supporting documentation to the regulatory agencies showing that the restoration parameters have remained at or below the restoration standards and will request that the well field be declared restored.

Given that any hot spots will be subject to additional evaluation of potential impacts outside of the exempted aquifer, there is no plausible scenario by which unrestored groundwater would be representative of conditions after NRC approval of groundwater restoration.

The requirement to use actual wellfield groundwater, rather than allowing the flexibility to use synthesized groundwater approximating field conditions, is contrary to many recent studies on natural attenuation that use synthesized groundwater (e.g., the Raymond Johnson papers cited in the Fact Sheet). Maintaining the stability of solutions even over short periods of time is difficult and requires special procedures. A restored wellfield groundwater solution is apt to be sensitive to redox changes. Collection and storage of this water will require extreme care to assure that oxygen is not introduced along the way. The “unrestored wellfield groundwater, taken from a wellfield in which uranium recovery has been initiated but before groundwater restoration as begun” is equally difficult to maintain. If this solution is dominantly lixiviant, it will contain excess uranium that will swamp the sorption sites on the small amount of core. Furthermore, even if it has undergone some dilution, it is likely to be oversaturated with respect to carbonate minerals, which will precipitate and change the composition of the solution. Inclusion of any additive to limit mineral formation would void any other result from the tests. Synthetic solutions can eliminate some of the stability problems if prepared immediately before a test, but some issues such as redox conditions are difficult to eliminate. This variability makes it impractical to conduct laboratory bench-scale testing as “pass/fail” tests.

As described in Attachment A-1, core samples for column testing would need to be collected prior to ISR operations and stored for 5 to 9 years or more, until regulatory approval of groundwater restoration. A proposed alternate approach to core sample collection is presented in Attachment A-1.

Limiting laboratory testing methods to column testing is contrary to the research cited in the Draft Class III Area Permit Fact Sheet. Johnson et al. used batch sorption testing rather than column testing for similar testing, yet the flexibility is not provided in the draft permit conditions to allow batch sorption testing or another approved laboratory testing method. At this time, much research related to the fate and transport of constituents from ISR operations is ongoing through research by Johnson, South Dakota School of Mines and Technology, Los Alamos National Laboratory, University of Wyoming, Colorado State University and others. For example, Los Alamos National Laboratory and others recently completed cross-hole evaluation of the natural attenuation of uranium, selenium and other constituents in order to evaluate the ability of the down-gradient aquifer to geochemically attenuate contaminant transport after mining (Exhibit 021). Limiting laboratory testing to prescriptive column testing requirements would not allow Powertech to take advantage of advancing research methodologies.

The prescriptive testing approach fails to consider the difficulties in the actual implementation of these tests when the findings will have such a bearing on closure costs. Maintaining redox conditions, particularly if reducing conditions are required, can be very difficult. The sorption experiments described in the Johnson et al. efforts are relatively simple, but they only consider one geochemical process, mainly simple surface complexation reactions for uranium only. The experiments used a very specific targeted research approach. To fully evaluate the geochemical setting requires various tests that represent contradictory conditions. For example, sorption as described in the Johnson et al. papers assumes uranyl ([U(VI)] and oxidized iron hydroxides as the substrate, whereas precipitation of uranium mineral typically assumes a lower valence, usually the U(IV) form. Maintaining low Eh conditions requires another level of effort, and it is unlikely that any commercial laboratory can demonstrate that these conditions can be maintained. Even specialized research laboratories struggle with these issues and typically resort to glove boxes which will tend to limit the size of the column. This creates additional issues regarding the scale of the column tests and the ability to extrapolate these results to an entire wellfield. There are a multitude of geochemical processes that cannot be addressed in column testing alone. For example, co-precipitation reactions (radium into barium sulfate) are likely to occur in small increments over large distances and take considerable time (Grundl and Cape 2006; **Exhibit 022**). These column tests completely fail for those conditions, and only certain types of models can be applied to evaluate such slow, large flow path processes.

Limiting the test method to any laboratory method would eliminate the possibility of using field-scale testing to determine geochemical modeling input parameters. This contradicts recent research by the Los Alamos National Laboratory and others, where they used cross-hole tests in an unmined ISR wellfield to determine the attenuation capacity for uranium and other constituents (**Exhibit 021**).

As described in Attachment A-3, Powertech requests the ability to prepare a Closure Plan that would include geochemical modeling using site-specific data to demonstrate that no ISR contaminants will cross the aquifer exemption boundary and cause a violation of MCLs or otherwise adversely affect human health. Powertech requests the ability to use column testing, batch sorption testing, or any other approved laboratory or field testing method to provide the site-specific inputs for geochemical modeling, should they be needed to support geochemical modeling efforts. Such tests would not be used as a stand-alone demonstration of the down-gradient natural attenuation capacity, but would be an integral part of the geochemical modeling. Powertech requests the flexibility to use synthesized groundwater representative of parameters and concentrations in the restored wellfield for such testing, should it be needed to support geochemical modeling efforts. Powertech also requests that rather than using unrestored groundwater for testing, geochemical modeling would evaluate any hot spots identified during stability monitoring, in accordance with NRC license requirements.

EPA Notes/Response	Exhibit Info
	Dewey-Burdock Technical Report Dec 2013 Prepared for NRC License

Exhibit 022 Grundl and Cape 2006 Geochemical Factors Controlling Radium Activity in a Sandstone Aquifer - Wiley Online Library

Exhibit 021 Reimus et al Cross-Hole Evaluation Natural Attenuation

Proposed Alternate Sc

Problem:

A-6-1:

A-6-2:

A-6-3:

A-6-4:

A-6-5:

A-6-6:

A-6-7:

A-6-8:

Proposed Alternate
Solution:

lternate Solution to Monitoring and Corrective Actions for an Excursion Detected in a Non-injection Interval Monitoring We

Part IX, Section C.3.f of the Draft Class III Area Permit includes additional monitoring and corrective action requirements for an excursion detected in a non-injection interval monitoring well beyond those reviewed and approved by NRC. Following are key differences between the proposed Draft Class III Area Permit conditions and the approved NRC license requirements:

1) License Condition (LC) 11.5 of NRC license SUA-1600 requires Powertech to increase the sampling frequency of a well with a confirmed excursion to at least once every 7 days for the excursion indicator parameters (chloride, specific conductance and total alkalinity) (**Exhibit 016** at 11). In contrast, Part IX, Section C.3.f.i would require analysis of the full suite of Table 8 parameters every 7 days for a non-injection interval monitoring well with a confirmed excursion.

2) LC 11.5 requires corrective actions for a confirmed excursion until all indicator parameters are below the upper control limits (UCLs) for three consecutive weekly samples. In contrast, Part IX, Section C.3.f.ii would require restoration of a non-injection zone aquifer well impacted by an excursion back to baseline concentrations for all constituents. Section C.3.f.iii would further require a trend analysis to determine whether there is an increasing concentration of any excursion parameter or baseline constituent, in which case Powertech would be required to sample the nearest unimpacted wells and analyze samples for the full suite of Table 8 baseline parameters.

3) LC 11.5 requires Powertech to terminate injection or increase the financial assurance in an amount to cover the full third-party cost of correcting and cleaning up the excursion if any excursion is not corrected within 60 days. In contrast, Part IX, Section C.3.f.iv would require Powertech to sample the nearest unimpacted wells and analyze samples for the full suite of Table 8 baseline parameters for a non-injection interval excursion not corrected within 60 days.

4) LC 11.5 requires Powertech to implement corrective actions for confirmed excursions that may include but are not limited to those specified in Section 5.7.8 of the approved NRC license application. In contrast, Part IX, Section C.3.f.vi indicates that if pumping is used to correct the excursion, then the pumping rate must be low enough to result in less than 1 foot of drawdown at the well being pumped.

Specific comments on the proposed permit conditions are presented below, followed by a proposed alternate solution.

The proposed additional corrective actions for an excursion in a non-injection interval monitoring well are unnecessary in light of NRC license requirements. As stated on page 116 of the Draft Class III Area Permit Fact Sheet, "The monitoring well detection system described in Section 12.5 is a proven method used at historically and currently operating facilities." Despite this acknowledgement and despite the fact that NRC has primary regulatory jurisdiction over excursion monitoring at ISR facilities, EPA is proposing to expand the excursion monitoring and corrective action requirements beyond those required for any other ISR facility in the U.S. Powertech requests deletion of these additional monitoring requirements because there is no justification for imposing them, and they are not required for other Class III permits for ISR facilities in the U.S., including within EPA Region 8.

Whereas the NRC license requirements do not require monitoring for anything other than the excursion detection parameters that provide early warning of potential to impact non-exempt groundwater, the proposed permit conditions would require monitoring the full suite of Table 8 parameters, many of which are reactive and will not travel as quickly as the excursion monitoring parameters (refer to Attachment A-3 for a discussion of the lag time in uranium transport compared to a conservative indicator parameter like chloride). Monitoring for these parameters would not increase the effectiveness of the early warning system to detect the potential to impact non-exempt groundwater.

Almost all of the parameters in Table 8 of the draft permit take significantly longer than 1 week for laboratory analysis. Other than the excursion monitoring parameters and pH, which Powertech will be able to analyze in its on-site laboratory, all other constituents will need to be analyzed by a third-party contract laboratory. According to Inter-Mountain Laboratories, an EPA-accredited laboratory in Sheridan, Wyoming, the standard turn-around time is 20 business days (about 1 month) for the full suite of Table 8 parameters. Even if a rush is placed on the analysis at a premium cost, the minimum turn-around time is 10 business days (about 2 weeks) for radiological constituents. For example, lead-210 requires 4 days to process and prepare the sample, 5 days for crystal ingrowth, 1 day to count radiological activity and 1 day to perform QA/QC and report (**Exhibit 013**). Therefore, it is technically infeasible and impractical to sample weekly for parameters that take 1 month to analyze. In contrast, Powertech will have the ability to analyze excursion parameters almost immediately on site, which again makes monitoring for these constituents better suited for an early warning system.

The NRC license requirement to correct an excursion such that three consecutive weekly samples are below the UCLs is a proven method of corrective action that has been used at domestic ISR facilities for decades without any evidence that an off-site impact to groundwater has occurred. As described in Attachment A-7, NRC staff evaluated historical records from NRC-licensed ISR facilities and determined that no excursion "had resulted in environmental impacts" (**Exhibit 001** at 2). Moreover, LC 11.5 of NRC license SUA-1600 indicates that "the licensee remediate the excursion to meet groundwater protection standards as required by LC 10.6 for all constituents established per LC 11.3." Thus, NRC license conditions already require remediation of all excursions to satisfy federal groundwater protection standards in 10 CFR Part 40, Appendix A, Criterion 5B(5).

The statement is made in Part IX, Section C.3.f.ii that "The Permittee shall restore a non-injection zone aquifer impacted by an excursion of injection zone fluids back to baseline concentrations." EPA is attempting to redefine what constitutes a remediated excursion as being one that is restored to baseline. This is inconsistent with the NRC definition of a remediated excursion and would lead to confusion for Powertech, regulators and the public, not to mention creating unnecessary economic hardship.

Unlike DGCB monitoring wells, the baseline concentrations for which would be updated prior to post-restoration groundwater monitoring, the baseline concentrations for non-injection interval monitoring wells would not be updated during operations. Therefore, comparing concentrations on a constituent-by-constituent basis with baseline values established years earlier could lead to false positives caused by natural variation in groundwater quality. For this reason it would be better to compare excursion monitoring parameters with UCLs, as required by NRC license requirements.

Aside from the alluvium (if present), non-injection interval monitoring wells all would be completed within the exempted aquifer (i.e., within sub-units of the Fall River or Chilson aquifer). Requiring restoration to baseline within the exempted aquifer is inconsistent with what is required for the production zone and is not necessary to prevent contamination outside of the exempted aquifer, since Powertech would be required to cease injection or post additional financial assurance for remediation of the excursion in the event that an excursion is not corrected within 60 days. In any event, Powertech would be required to remediate all excursions prior to site closure. EPA has provided no evidence that an isolated excursion in a non-injection interval monitoring well, remediated according to NRC license requirements, has the potential to impact groundwater quality outside of the exempted aquifer.

Powertech could find no justification in the draft permit or fact sheet for limiting the pumping rate to an amount that would result in less than 1 foot of drawdown at the pumped well, if pumping is used for corrective action. For the alluvial aquifer in particular, which is under water table conditions, the ability to prevent the outward migration of impacted groundwater while limiting drawdown in the pumped well to 1 foot would not be technically feasible. Similarly, for bedrock aquifers, an absolute and very small limit on the drawdown could inhibit Powertech's ability to correct the excursion and prevent the outward spread of impacted groundwater. It is not feasible for EPA to determine an arbitrary level of drawdown required to control an excursion. The amount of drawdown required would depend on: (1) the pumping rate required, (2) well completion efficiency, (3) formation transmissivity and (4) residual effects from offset injection and production wells.

Powertech requests the following alternate solution for monitoring and corrective actions for an excursion in a non-injection interval monitoring well:

1) No change would occur in the procedures for a confirmed excursion beyond what has been reviewed and approved by NRC, as long as the excursion is corrected within 60 days. This includes notifying NRC and EPA, sampling the well with a confirmed excursion for excursion parameters at least once every 7 days, and performing corrective actions as specified in the NRC license. Correcting an excursion within 60 days such that three consecutive weekly samples are below the UCLs is a proven method of preventing contamination outside of the exempted aquifer and is at least as protective as the methods proposed by EPA, which are impractical and technically infeasible due to relatively long laboratory analysis times and the potential for false positives caused by not updating baseline concentrations in non-injection interval monitoring wells.

2) Three changes are proposed if an excursion in a non-injection interval monitoring well is not corrected within 60 days:

a. The State of Wyoming requires analysis of a comprehensive list of parameters only if an excursion is not corrected in a timely manner (**Exhibit 004** at p. 22). A second sample must be analyzed for the same list of parameters after the excursion is corrected. Powertech would be willing to add this requirement to help EPA determine that there is no potential for impacts outside of the exempted aquifer.

b. If the excursion occurs in the alluvium, which is not part of the exempted aquifer, Powertech proposes to restore the water quality consistent with baseline concentrations or to an MCL, whichever is greater. Powertech does not propose to conduct the trend analysis in Part IX, Section C.3.f.iii (second number iii), since it is unnecessary given the stringent requirement to restore all constituents to baseline groundwater protection limits.

c. If the excursion occurs within the exempted aquifer, Powertech proposes to conduct an analysis of the potential to impact groundwater quality outside of the exempted aquifer considering site-specific conditions, corrective actions and monitoring results.

al Monitoring Well	EPA Notes Response	Exhibit Info
		Exhibit 016 License SUA-1600 Amendment 1 ML16202A174

Exhibit 013 IML Laboratory Turn Around Time

Exhibit 001 NRC Staff Assessment

December 2008 "Briefing on Uranium Recovery," SRM-M081211 (ADAMS Accession No. ML090080206) www.nrc.gov/docs/ML0900/ML090080206.pdf

Exhibit 004 WDEQ LQD
Guideline_4_Final_10_28_13

Proposed Alternate Solu

Problem:

A-7-1:

A-7-2:

A-7-3:

A-7-4:

A-7-5:

A-7-6:

A-7-7:

A-7-8:

A-7-9:

A-7-10:

Proposed Alternate
Solution:

ernate Solution to Monitoring and Corrective Actions for an "Expanding Excursion Plume"

Part IX, Section C.4 of the Draft Class III Area Permit proposes additional monitoring and corrective action requirements for an "expanding excursion plume." Following are technical comments regarding the technical feasibility of the proposed requirements, followed by a proposed alternate solution.

EPA has presented no evidence in the draft permit or fact sheet that "expanding excursion plumes" have occurred at other ISR facilities; therefore, there is no need to modify the proven excursion monitoring system that has been reviewed and approved by NRC. As stated on page 116 of the Draft Class III Area Permit Fact Sheet, "The monitoring well detection system described in Section 12.5 is a proven method used at historically and currently operating facilities." Despite this acknowledgement, EPA is proposing to expand the excursion monitoring and corrective action requirements beyond what is required for any other ISR facility in the U.S., including those within EPA Region 8.

There can be no justification for monitoring to address an expanding excursion plume. During uranium ISR operations and groundwater restoration, when excursion monitoring would occur, an inward hydraulic gradient would be present within each wellfield, such that the down-gradient flow direction from all perimeter monitoring wells would be inward toward the wellfield. The proposed requirement to install additional "down-gradient" wells is confusing and inconsistent with hydraulic conditions during operations, when the greatest potential for an excursion would occur.

Installing and sampling additional wells between the perimeter monitoring well ring and the aquifer exemption boundary would actually draw more impacted groundwater toward the aquifer exemption boundary. The well development process involves water withdrawals during air lifting, swabbing or pumping (see Section 11.4 of the Class III permit application). This development process would create local perturbations in the potentiometric surface established during operations and would have the potential to draw ISR solutions out of the wellfield. Water collected during sampling the additional wells would compound the impact. This makes the additional well installation requirements less protective than current NRC license requirements.

Installing additional monitoring wells during ISR operations without pump testing to verify that the wells are in hydraulic communication with the production interval could lead to difficulty in demonstrating that the wells are suited for their intended purpose. However, pump testing would not be technically feasible during ISR operations, where the cone of depression within the wellfield would have to be allowed to recover to perform such a test. This would result in loss of hydraulic control for the wellfield and increase the risk of contaminant migration. It would also violate NRC license requirements to not maintain a cone of depression during ISR operations and groundwater restoration.

The excursion monitoring system is designed to provide an early warning of potential contaminant migration using non-hazardous indicator parameters that are not significantly attenuated in concentration or travel time compared to the groundwater flow. As such, they are designed to detect the leading edge of an excursion plume emanating from the wellfield. NRC license requirements to immediately correct an excursion (typically by adjusting the wellfield balance to draw solutions back into the wellfield) are designed to correct the imbalance before any contaminants that could cause a violation of MCLs or otherwise adversely affect human health reach the perimeter monitoring well. This is confirmed through weekly sampling until three consecutive samples are below the UCLs. Since the leading edge of an excursion plume would be detected and remediated under NRC license requirements, there is no mechanism for an excursion plume to expand beyond the perimeter monitoring well ring under NRC license requirements.

If an excursion persists for 60 days or more, License Condition 11.5 of NRC license SUA-1600 would require Powertech to terminate injection of lixiviant into the wellfield until the excursion is corrected or increase the financial assurance in an amount to cover the full third-party cost of correcting and cleaning up the excursion. This existing requirement will ensure that an expanding excursion plume is addressed and corrected.

Whereas the NRC license requirements focus on monitoring for the excursion monitoring parameters that provide early warning of the potential to impact non-exempt groundwater, the proposed draft permit would require monitoring the full suite of Table 8 parameters, many of which are reactive and will move more slowly and at reduced concentrations compared to the excursion monitoring parameters. Monitoring for such additional parameters would not increase the effectiveness of the early warning system to detect the potential to impact non-exempt groundwater.

Other than the excursion monitoring parameters, all of the parameters in Table 8 of the draft permit take significantly longer than 1 week for laboratory analysis. As described in comment #A-6-3, the standard turn-around time is 20 business days (about 1 month) for the full suite of parameters, and the minimum turn-around time is 10 business days (about 2 weeks). Therefore, it is technically infeasible and impractical to sample weekly for parameters that take 1 month to analyze. In contrast, Powertech will have the ability to analyze excursion parameters almost immediately on site, which again makes monitoring for these constituents better suited for an early warning system.

EPA has not included any provisions for performing adequate baseline characterization for the new down-gradient wells. Unless adequate baseline characterization is performed on any new monitoring wells (i.e., at least four samples per NRC license requirements), there is no way to verify whether any elevated concentrations in a new monitoring well are caused by an excursion or are attributed to natural variation in the monitoring interval. This is particularly true for situations where one wellfield is upgradient from another. Installing a new well at a down-gradient location could place the well within a mineralized horizon, which has the potential to result in local variations in groundwater quality, as acknowledged in the draft permit.

Powertech is required by NRC license requirements to sample all perimeter monitoring wells every 2 weeks during ISR operations for the excursion monitoring parameters, which are designed to provide early warning of potential impacted groundwater. Thus, if a perimeter monitoring well had a confirmed excursion, all of the other perimeter monitoring wells, including adjacent wells, would be sampled every 2 weeks. This would allow Powertech to determine the extent of groundwater impacts, develop corrective action measures, monitor implementation of the measures and demonstrate excursion control consistent with the NRC license requirements without installing additional wells or performing the additional monitoring proposed in the draft Class III permit.

No additional monitoring requirements are needed for a potential expanding excursion plume beyond those required by the NRC license. Powertech requests removal of the proposed additional monitoring and corrective action requirements due to the following reasons:

1) The excursion monitoring program reviewed and approved by NRC is a proven method of detecting excursions and will provide timely detection and correction of a potential expanding excursion plume. This is documented in a 2009 memorandum from NRC staff to the Commission (**Exhibit 001** at 1-2):

With regard to the migration of production liquids toward the surrounding aquifer, each licensee must define and monitor a set of nonhazardous parameters to identify any unintended movement toward the surrounding aquifer. Exceedances of those parameters result in an event termed an excursion; excursion events are not necessarily environmental impacts but just indicators of the unintended movement of production fluids. The data show over 60 events had occurred at the 3 facilities. For most of those events, the licensees were able to control and reverse them through pumping and extraction at nearby wells. Most excursions were short-lived, although a few of them continued for several years. None had resulted in environmental impacts.

2) Installing additional wells between the perimeter monitoring well ring and the aquifer exemption boundary would have many disadvantages, including further drawing impacted groundwater away from the wellfield during well development and sampling, and causing false positives due to inadequate baseline characterization.

3) Sampling for the full suite of Table 8 parameters would not improve Powertech's ability to provide timely detection of an excursion, since many of these constituents travel relatively slowly compared to the early warning parameters and take much more time to analyze in a laboratory.

EPA Notes/Response	Exhibit Info

Exhibit 001 NRC Staff Assessment

Proposed Alternate Solution to Monitoring and Corrective Actions for a "Remnant Excursion Plume"

Problem:	Part IX, Section C.4.b.ii.E through I of the Draft Class III Area Permit proposes additional monitoring and corrective action requirements for a "remnant excursion plume." Following are technical comments regarding the technical feasibility of the proposed requirements, followed by a proposed alternate solution.
A-8-1:	Absent any evidence that "remnant excursion plumes" have occurred at other ISR facilities, there is no need to modify the proven excursion monitoring system that has been reviewed and approved by NRC. As stated on page 116 of the Draft Class III Area Permit Fact Sheet, "The monitoring well detection system described in Section 12.5 is a proven method used at historically and currently operating facilities." Despite this acknowledgement, EPA is proposing to expand the excursion monitoring and corrective action requirements beyond what is required for any other ISR facility in the U.S.
A-8-2:	NRC license requirements require Powertech to continue sampling all excursion monitoring wells from the onset of ISR operations through the end of groundwater restoration. This includes all perimeter monitoring wells and non-injection interval monitoring wells. If an excursion has not been fully remediated, it will be detected in future sampling events under the excursion monitoring program reviewed and approved by NRC.
A-8-3:	The proposed requirement to extend the excursion monitoring program for additional down-gradient monitoring wells through the end of post-restoration groundwater monitoring is not warranted. Current NRC license requirements require Powertech to monitor all perimeter monitoring wells through the end of groundwater restoration. After groundwater restoration is complete, there is no nexus for an excursion to occur, since the groundwater would have been restored and no injection would occur into the wellfield.
A-8-4:	Whereas the NRC license requirements focus on monitoring for the excursion monitoring parameters that provide early warning of potential impacted groundwater, the proposed draft permit would require monitoring the full suite of Table 8 parameters, many of which are reactive and will not travel as quickly as the excursion monitoring parameters. Monitoring for these parameters would not increase the effectiveness of the early warning system to detect potential impacted groundwater.
A-8-5:	Other than the excursion monitoring parameters, all of the parameters in Table 8 of the draft permit take significantly longer than 1 week for laboratory analysis. As described in comment #A-6-3, the standard turn-around time is 20 business days (about 1 month) for the full suite of parameters, and the minimum turn-around time is 10 business days (about 2 weeks). Therefore, it is technically infeasible and impractical to sample weekly for parameters that take 1 month to analyze. In contrast, Powertech will have the ability to analyze excursion parameters almost immediately on site, which again makes monitoring for these constituents better suited for an early warning system.

A-8-6: The specific conductance threshold of 20% in Part IX, Section C.4.b.ii.F is inconsistent with NRC license requirements and likely to result in a large number of false positives. The NRC definition of an excursion is one constituent exceeding its UCL by 20% or two or more constituents exceeding the UCLs. The proposed condition sets the threshold at 20% above the initial concentration from the well, rather than 20% above the UCL. This is very likely to result in false positives due to natural variation in the specific conductance within the monitoring interval.

A-8-7: The proposed requirement in Part IX, Section C.4.b.ii.G to "immediately begin pumping the impacted well(s)" if a remnant excursion is detected is contrary to standard excursion recovery methods described in the approved NRC license application. Section 5.7.8.4.5 of the approved NRC license application describes how the typical method to correct an excursion is to adjust the flow rates of the injection and recovery wells within the wellfield to increase the aquifer bleed in the area of the excursion and draw impacted groundwater back into the wellfield pattern area. In contrast, the requirement to immediately begin pumping the well with a confirmed excursion would draw impacted groundwater away from the wellfield pattern area toward the aquifer exemption boundary. This would be less protective than excursion corrective actions required under NRC license requirements. Further, the proposed EPA approach could cause direct violation of NRC license conditions.

Proposed Alternate Solution: No additional monitoring requirements are needed for a potential remnant excursion plume beyond those required by the NRC license. Powertech requests removal of the proposed additional monitoring and corrective action requirements due to the following reasons:

1) The excursion monitoring program reviewed and approved by NRC is a proven method of detecting excursions and will provide timely detection and correction of a potential remnant excursion plume (refer to additional information in Attachment A-7).

2) The proposed 20% specific conductance threshold is inconsistent with the NRC excursion criteria and is likely to result in false positives. Monitoring for potential remnant excursion plumes through standard excursion monitoring techniques and threshold criteria will provide timely detection of a potential remnant excursion plume.

3) There is no need to extend the excursion monitoring schedule for any wells through the end of post-restoration groundwater monitoring, since there is no nexus for an excursion to occur after groundwater restoration is complete.

EPA Notes/Response	Exhibit Info

Ex. 5 Deliberative Process (DP)

Proposed Alternate

Note:

Problem:

A-9-1:

A-9-2:

A-9-3:

A-9-4:

A-9-5:

A-9-6:

A-9-7:

Proposed Alternate
Solution:

ernate Solution to Non-injection Interval Monitoring during Post-restoration Groundwater Monitoring

As described in Attachment A-3, Powertech has proposed an alternate solution to post-restoration groundwater monitoring. In the event that this solution is not approved, this proposed alternate discusses proposed revisions to the monitoring requirements for non-injection interval monitoring wells during post-restoration groundwater monitoring.

Part IX, Section E.4 of the Draft Class III Area Permit would require Powertech to collect groundwater samples every 6 months from non-injection interval monitoring wells and analyze them for the full suite of Table 8 parameters during post-restoration groundwater monitoring. Following are technical comments on the need for and technical feasibility of this proposed requirement, followed by a proposed alternate solution.

The NRC license requires excursion monitoring from the onset of ISR operations through the end of groundwater restoration. There is no nexus for an excursion to occur after groundwater restoration is complete, since the groundwater would have been restored and no injection would occur into the wellfield. This is especially true for the non-injection interval monitoring wells, which are separated from the production zone by overlying and underlying confining units.

If a vertical excursion occurs during ISR operations or groundwater restoration, it would have to be remediated in accordance with NRC license requirements.

No explanation could be found in the draft permit or fact sheet for the need for non-injection interval excursion monitoring during post-restoration groundwater monitoring.

No justification is provided for the proposed requirement to sample the non-injection interval monitoring wells for the full suite of Table 8 parameters rather than excursion detection parameters. As described in Attachments 6 through 8, additional parameters are not as effective at detecting a potential release due to slower transport, attenuation, longer laboratory analysis times, and lack of provisions to update baseline concentrations.

The proposed requirement in Part IX, Section E.4 to compare sample results with baseline standards is not consistent with EPA Unified Guidance (Exhibit 019), since it proceeds directly to compliance/assessment monitoring without the use of detection monitoring to determine whether a release occurs. Section 1.1 of EPA Unified Guidance describes how detection monitoring is used to "assess whether a hazardous constituent release has occurred," whereas compliance/assessment monitoring is used to "determine whether measured levels meet the compliance standards." See also comments in Attachment A-3. It would be more appropriate to use excursion monitoring parameters to determine whether a release occurs and follow that up with compliance/assessment monitoring if needed based on excursion (detection) monitoring results.

The proposed requirements are not consistent with EPA **Unified Guidance** in that they do not include provisions for updating baseline water quality. Comparing results during post-restoration groundwater monitoring to those collected some 5 to 9 years earlier during pre-operational baseline monitoring would not account for any natural changes in the non-injection interval water quality.

The proposed requirements are not consistent with EPA **Unified Guidance** in that they do not include provisions for retesting. Retesting is an important aspect of any groundwater detection monitoring program, and an excursion should not be confirmed without retesting. This is supported by EPA Unified guidance, which states: "Except for small sites with a very limited number of tests, any of the three detection monitoring options [including tolerance intervals such as UCLs] should incorporate some manner of retesting" (**Exhibit 019** at p. 6-4).

No additional monitoring requirements are needed for a potential excursion during post-restoration groundwater monitoring beyond the excursion monitoring requirements included in the NRC license. Powertech requests removal or modification of the proposed additional monitoring and corrective action requirements due to the following reasons:

1) The excursion monitoring program reviewed and approved by NRC is a proven method of detecting excursions and will provide timely detection and correction of a potential vertical excursion during ISR operations and groundwater restoration, which are the only times that injection will occur in the wellfield.

2) There is no need to extend the excursion monitoring schedule for any wells through the end of post-restoration groundwater monitoring, since there is no nexus for an excursion to occur after groundwater restoration is complete.

3) If EPA imposes the requirement to conduct excursion monitoring in the non-injection interval monitoring wells during post-restoration groundwater monitoring, Powertech requests that the parameter list be limited to the excursion monitoring parameters, which have proven effective at timely detection of a potential release at historically operated ISR facilities.

4) Per draft permit Part VII requirements, Powertech is required to maintain mechanical integrity of injection and production wells until such wells are plugged and abandoned. This provides added assurance that a long-term pathway between the production zone and non-injection monitoring intervals does not exist.

EPA Notes/Response	Exhibit Info

Ex. 5 Deliberative Process (DP)

Ex. 5 Deliberative Process (DP)

Exhibit 019 Unified Guidance Statistical Analysis of GW Monitoring Data at RCRA Facilities

Proposed Alternate Sol

Problem:

A-10-1:

A-10-2:

A-10-3:

A-10-4:

A-10-5:

A-10-6:

Proposed Alternate
Solution:

ternate Solution to Aquifer Exemption Boundary Location

Following are technical comments on the currently proposed aquifer exemption boundary location in light of the proposed additional monitoring requirements, followed by a proposed alternate solution.

The proposed exempted aquifer boundary does not provide adequate room for the additional groundwater monitoring and corrective action requirements proposed in the draft permit. Powertech originally proposed an aquifer exemption boundary extending 1,600 feet from the potential wellfield pattern areas in its December 2008 Class III permit application (**Exhibit 023** at p. 17-3). Justification for that aquifer exemption boundary proposal included adequate room to install the monitoring well network, potential worst-case fluid flow velocity during mining and response time needed to detect and correct a potential horizontal excursion. **In response to a request from EPA,** Powertech revised its proposed aquifer exemption boundary in the July 2012 update to the Class III permit application to include only the 14 proposed wellfields, potential perimeter monitoring well rings and a buffer area extending 120 feet from the monitoring well rings. As described in Appendix M of the updated Class III permit application, the general approach to calculate the buffer area was similar to what had been recently approved by EPA Region 8 for the Ur-Energy Lost Creek ISR Project in Wyoming.

The approach originally proposed by Powertech is completely consistent with accepted approaches to designating an exempted aquifer for a uranium ISR project. For example, the Nebraska Department of Environmental Quality granted an exemption for the entire license amendment area for the proposed North Trend Expansion to the Crow Butte ISR Project (compare **Exhibit 027** at 7 with **Exhibit 028**). For a Class III permit, the regulations include an explicit requirement that the Director shall "consider Information contained in the mining plan for the proposed project, such as a map and general description of the mining zone, general information on the mineralogy and geochemistry of the mining zone, analysis of the amenability of the mining zone to the proposed mining method, and a time-table of planned development of the mining zone." 40 CFR § 144.7(c)(1). This requirement frames consideration of the approach to identifying and describing the exempted portion of the aquifer – 40 CFR § 144.7(c)(1) – by tying it to the mining plan. Among other things, this means that EPA must bear in mind that some of the details will remain uncertain until the mining plan has been implemented to further delineate the actual production areas. It further means that the original definition and description of the exempted aquifer must allow for the flexibility necessary to accommodate the implementation of the mining plan.

UIC Guidance 34 also emphasizes the importance of the development plans by noting the importance of considering "a summary of logging which indicates that commercially producible quantities of minerals are present, a description of the mining method to be used, general information on the mineralogy and geochemistry of the mining zone, and a development timetable." This recognition of the development timetable includes an implicit recognition that some of the details of the exempted portion of the aquifer may need to be filled in as the mining program unfolds. Guidance further recognizes the importance of incorporating a "buffer zone" wherever it is possible to identify the existence of such a zone between the delineated mining areas and "any water supply wells which tap the proposed exempted aquifer" (Guidance 34, Attachment 3 at 2). Further, the Guidance indicates that the "buffer zone should extend a minimum of a 1/4 mile" outside of the designated mining area. In short, Guidance 34 reiterates the importance that the mandatory consideration of the mining plan plays in the delineation of the exempted aquifer and recognizes that the initial designation may need to be broad enough to allow for further adjustment as the mining plan is implemented and more detailed information obtained to further define the exempted portion of the aquifer. Any change of the designation pursuant to the additional information about the mining areas would be a non-substantial revision.

Powertech's modified proposal for an aquifer exemption boundary relatively close to the perimeter monitoring well rings was based on the reasonable expectation that the Dewey-Burdock Project groundwater monitoring and corrective action requirements would be consistent with those used at other ISR projects in EPA Region 8, including the Lost Creek ISR Project and other Wyoming projects for which EPA granted similar aquifer exemption approvals (i.e., the Ross ISR Project and Reno Creek ISR Project). At the time Powertech proposed the 120-foot offset distance from the perimeter monitoring well ring, EPA gave no indication that it would radically depart from past practice to impose additional groundwater monitoring and corrective action requirements in the draft Class III permit beyond those previously required by NRC or state Class III UIC programs such as that in Wyoming. These additional proposed groundwater monitoring and corrective action requirements that would encroach on the buffer area available between the perimeter monitoring well rings and aquifer exemption boundary and are incompatible with the currently proposed aquifer exemption boundary. Specific examples include:

1) Part IV, Section B.14 of the draft permit would allow Powertech to pump DGCB monitoring wells to decrease the travel time for groundwater from the restored production zone to reach the down-gradient wells. Pumping would significantly increase the groundwater velocity and would lessen time to respond to a statistically significant increase in concentration at a DGCB monitoring well in order to prevent a contaminant from reaching the aquifer exemption boundary and cause a violation of MCLs or otherwise adversely affect human health.

2) Part IX, Section B.10 of the draft permit would trigger non-compliance if any baseline constituent experiences a statistically significant increase above baseline concentrations at a DGCB monitoring well. Additional buffer area would be needed to address conservative and non-hazardous constituents such as sodium and chloride, which would not undergo geochemical attenuation.

3) Part IX, Section B.13 of the draft permit would require Powertech to install at least one new DGCB monitoring well down-gradient from a DGCB monitoring well that experiences a statistically significant increase in the concentration of any baseline constituent during post-restoration groundwater monitoring. There is no provision in the currently proposed aquifer exemption boundary to accommodate the installation, development and sampling of additional down-gradient wells.

4) Part IX, Section C.4 would require the installation of additional monitoring wells between the perimeter monitoring well ring and the aquifer exemption boundary in the event of a confirmed "expanding excursion plume." As described in comment #A-7-3, installing and sampling additional wells in this buffer area would draw more impacted groundwater toward the aquifer exemption boundary.

5) Part IX, Section C.3.f.v would similarly require the installation of additional monitoring wells down-gradient from a non-injection interval monitoring well impacted by an excursion under certain conditions.

6) The currently proposed aquifer exemption boundary was based on monitoring for excursion parameters (chloride, total alkalinity and specific conductance) that would be analyzed very quickly in Powertech's on-site laboratory. In contrast, Part IX, Section C.4 and other draft provisions would require excursion monitoring for the full suite of Table 8 parameters. As described in comment #A-6-3, the laboratory turn-around time for some of these added constituents is up to 1 month. The calculation of the time for excursion detection and corrective action used to justify the currently proposed aquifer exemption boundary does not consider the added laboratory analysis time.

As described in comment #E2 in Table 3, it is unclear whether the currently proposed aquifer exemption boundary is the green-dashed boundary shown in Figure 2 of the draft Aquifer Exemption ROD or whether it will be defined as 120 feet from the final perimeter monitoring well ring locations. If the green-dashed boundary shown in Figure 2 will be used to define the aquifer exemption boundary, there is a high likelihood that one or more modifications to the aquifer exemption boundary will be needed during wellfield design and construction, since the current boundary is based on the approximate perimeter monitoring well ring locations, which are subject to change during delineation drilling. Powertech is aware that two recent modifications to aquifer exemption boundaries for Wyoming ISR projects necessitated public notice even though the modification areas were small fractions of the total aquifer exemption area. One example is the Ross ISR Project, where EPA required public notice for a 1.1-acre modification to a 995-acre aquifer exemption area (0.115% of the exempted area) (**Exhibit 029**). The recommended inclusion of a buffer zone in the initial delineation of the exempted portion of the aquifer would avoid these unnecessary additional administrative procedures.

The proposed aquifer exemption boundary is inconsistent with larger exemptions granted by EPA Region 6 for uranium ISR projects in Texas. As recently as April 2017, EPA Region 6 granted an aquifer exemption for the UEC Burke Hollow ISR Project that included 5,384 acres, or about half of the 11,000-acre mine permit area (**Exhibit 024**). The aquifer exemption approval is provided as Exhibit 030. As discussed previously, an aquifer exemption approval for the entire mine permit area was granted for the proposed North Trend Expansion to the Crow Butte ISR Project, which is within EPA Region 8 (**Exhibits 027** and **028**). Such relatively larger aquifer exemption boundaries provide those ISR operations with confidence that minor adjustments may be made in wellfield boundaries without having to go through the major modification process to change the aquifer exemption boundary.

To Powertech's knowledge, EPA has never provided justification for the need to minimize the aquifer exemption area for uranium ISR projects within the jurisdiction of EPA Region 8.

Regardless of whether Powertech's alternate solutions to post-restoration groundwater monitoring (Attachment A-3), monitoring and corrective actions for an excursion detected in a non-injection interval monitoring well (Attachment A-6), monitoring and corrective actions for an "expanding excursion plume" (Attachment A-7), monitoring and corrective actions for a "remnant excursion plume" (Attachment A-8) and non-injection interval monitoring during post-restoration groundwater monitoring (Attachment A-9) are incorporated, EPA needs to revise the designation of the exempted aquifer to include a buffer that allows for further adjustment as the wellfields are developed. Powertech requests modifications to EPA's proposed aquifer exemption boundary.

Powertech requests a larger aquifer exemption boundary to account for the additional groundwater monitoring and corrective action requirements. Even if all of Powertech's alternate solutions are accepted by EPA, unprecedented geochemical modeling would still be required to demonstrate that no contaminants will cross the aquifer exemption boundary and cause a violation of any primary MCLs or otherwise adversely affect the health of persons. A larger buffer area would provide additional assurance that such impacts to the non-exempt aquifer would not occur. **Specifically, Powertech requests a buffer area ¼ mile from the ore bodies depicted in Figures 2a and 2b of the draft permit. This would equate to a distance of approximately 1,320 feet from the proposed injection and production wells and 920 feet from the proposed perimeter monitoring well rings.** Justification for this proposed alternate solution includes the following:

1) A larger buffer area would provide added assurance that no impacted groundwater would cross the aquifer exemption boundary. For hazardous and reactive constituents such as uranium, the additional distance would provide added capacity for natural attenuation through adsorption, precipitation and other geochemical reactions. For all constituents, including non-hazardous and conservative constituents such as sodium and chloride, the additional distance would provide added capacity for dispersion, diffusion and other processes that would reduce the concentrations over a longer travel distance.

2) If post-restoration groundwater monitoring is required, a larger aquifer exemption boundary is essential to provide a buffer area needed to pump the DGCB monitoring wells and install additional DGCB monitoring wells, if needed.

3) A larger buffer area would allow for detection and correction of potential excursions without risking impact to the non-exempt aquifer. Industry standard excursion corrective actions such as increasing the bleed in the vicinity of a horizontal excursion would have adequate time for implementation without needing to resort to novel corrective actions such as installing additional down-gradient monitoring wells.

4) If Powertech is required to install additional monitoring wells down-gradient from perimeter or non-injection interval monitoring wells during an excursion, the larger buffer area would make it possible to install, develop and sample the wells without drawing solutions close to the aquifer exemption boundary.

5) Due to Powertech's commitment to avoid installing ISR production and injection wells within 1,600 feet of the permit boundary (as described under Part II, Section A of the draft permit), the aquifer exemption boundary must be at least 280 feet inside of the permit area at all locations (calculated as 1,600 feet from wellfield to permit boundary minus 1,320 feet from wellfield to aquifer exemption boundary).

6) No drinking water wells are included in the larger traditional aquifer exemption area.

7) No significant impact is anticipated to any nearby drinking water wells based on the very conservative capture zone analysis provided with the draft permit.

8) Powertech and EPA would have the flexibility to adjust final wellfield boundaries during delineation drilling without modifying the aquifer exemption boundary. This would avoid significant time and cost by EPA staff in approving what could be relatively frequent modification applications for very small changes to the aquifer exemption boundary.

9) The adjusted aquifer exemption boundary would encompass about 4,420 acres of the 10,580-acre permit area (42 percent). This is a smaller percentage than the recently approved aquifer exemption for the Burke Hollow ISR Project by EPA Region 6.

10) Sampling results summarized in Section 17.7 of the Class III permit application demonstrate that the groundwater quality in the Fall River and Chilson aquifers is unfit for human consumption throughout the permit area. Therefore, expanding the aquifer exemption boundary would serve to designate further groundwater that is unfit for human consumption and therefore is not a USDW.

EPA Notes/Response	Exhibit Info
Ex. 5 Deliberative Process (DP)	**Exhibit 023** December 2008 Class III Permit Application
	Exhibit 027 Crow Butte N Trend Aquifer Exemption Approval ML15104A710
	Exhibit 028 Crow Butte N Trend TR Fig 1.7-4 ML071760344

Ex. 5 Deliberative Process (DP)

Ex. 5 Deliberative Process (DP)

Exhibit 029 Email from Strata to NRC re Aquifer Exemption Modification ML16201A054

Exhibit 024 UEC Burke Hollow Aquifer Exemption Approval

Ex. 5 Deliberative Process (DP)

Ex. 5 Deliberative Process (DP)